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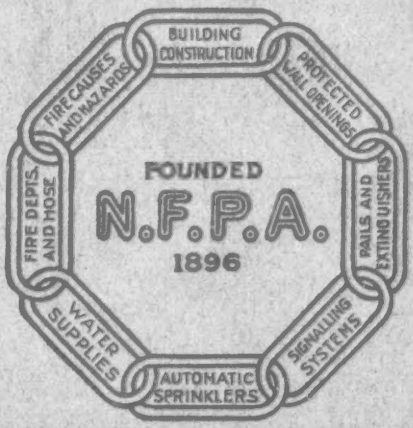

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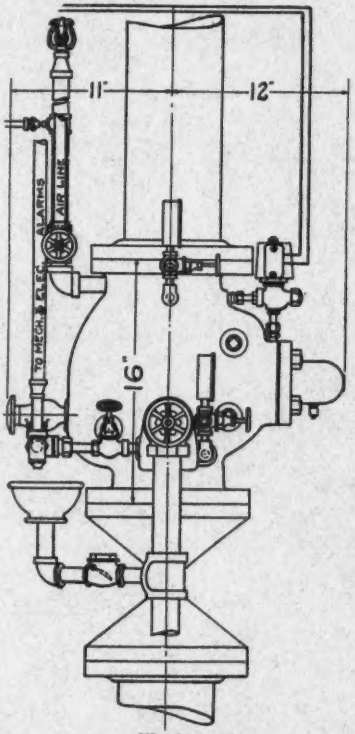

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Vol. 29 October, 1935 No. 2

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Reports of fires appearing in the Quarterly are copies of or extracts from written reports forwarded to the Association. This Association, as a body, is not responsible for the statements or opinions of any of its members.

V. Covert Martin.

The Taylor Milling Co. fire, Stockton, Calif., burned on June 24, 1935, with a loss of $400,000. Fire started in an unsprinklered portion of the plant. The fire department pumpers drained city water mains of their limited supply, so that when the fire spread to the sprinklered buildings there was no water for the sprinklers. The sprinklered mill building shown in this picture was the last to burn. Note falling wall at right center. **See report on page 167.**

The Quarterly

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Intelligence at Lowest Ebb. The blunders associated with the origin and spread of most major fires are a sad commentary on the mental development of the human race. Some fires are due purely to fortuitous circumstance, but in the majority of cases it appears that the exercise of the most elementary intelligence might have avoided the fire altogether or resulted in its control with small loss.

It is perhaps not surprising that persons not trained for the handling of fire emergencies do not always react intelligently when confronted with a serious fire situation, but a considerable proportion of fire reports recorded with the N.F.P.A. Executive Office, particularly where loss of life is involved, reflect an almost unbelievably low degree of mentality. For example, in this day and age it is almost inconceivable that anyone, unless with suicidal intent, should place an open bucket of gasoline on a kitchen stove to heat. Yet the heating of gasoline in buckets on kitchen stoves is a cause of fire fatalities frequently recorded in the loss of life tables in the QUARTERLY.

Public education, particularly in the schools, has already been a major influence in reducing the incidence of fire, but it appears that no matter how intensive the fire prevention educational effort, there will remain a certain irreducible minimum of fires due to the failure of the human element. The best thought in the fire protection fraternity, while in no wise reducing the emphasis on the value of fire prevention education, is increasingly turning to measures of fire control which do not depend upon the intelligent behavior of the general public, measures such as minimizing the use of highly combustible materials, the installation of automatic extinguishing equipment, and automatic fire detection with arrangements to assure the prompt response of the fire department or other personnel especially trained in the handling of fire emergencies.

* * * * * *

Catching the False Alarmist. Was her name Fatima — that lovely wife of Bluebeard who couldn't wash the blood off the key she had used to open the door of the forbidden room? And was it not Great Claus who always smeared something on the bottom of his bushel measure before he loaned it to Little Claus, so he would know what Little Claus was measuring?

the last to burn. Note falling wall at right center. See report on page 167.

Toledo, Ohio, reading its Arabian Nights and its Hans Christian Andersen, has evolved from those areas of romance a whacking good scheme to catch those mischievous moronic individuals who like to turn in false fire alarms. It is a much more delicate operation than that of the mechanical device which handcuffs the alarm-box opener and holds him until the firemen come to release him—or a racketeer goes through his pockets. It is nothing more nor less than smearing the hook of the box with an indelible pigment in the form of paste, which the cops can discover on the offender's index finger.

Toledo has secured seven convictions since somebody thought of this clever artifice. In four of the cases the officers didn't even need to explain the trick to the judge. They merely pointed out to the culprit the stain on his finger, which in each case brought a confession to secure a modified punishment.

The false alarm operators are not a depraved sort of criminal. They are often only mischievous boys, and sometimes mild mental defectives. The judges are reluctant to be too hard on them. Last month four 17-year-old Wellesley, Mass., boys, who had turned in an alarm in Weston for a thrill, were ordered by the judge of the district court to go regularly to the Weston fire department for work in cleaning and polishing the fire trucks and doing other manual work about the station. The judge thought that would be better for them than a night in jail or a fine to be paid by their parents.

It is hard to convict these petty culprits unless they confess, or someone actually sees them pull the box; and most people do not like to appear in court as complaining witnesses. In these circumstances it is amazing to see how prevalent the offense of sending in false alarms really is. The results are usually harmless enough. Outside, however, of the useless wear and tear of operating the apparatus unnecessarily there is the increasing danger to life in the runs through modern vehicular traffic and the ever present possibility of the trucks and engines being away from their stations when the call for a really important fire may come in.

* * * * * *

Fire Inquests. Legislation in several states provides for the holding of inquests into the circumstances of questionable fires, to be conducted by the local fire marshal or other appropriate authority. This plan, seldom followed except in the case of fires of supposedly incendiary origin, could well be extended to include formal proceedings for the investigation of every fire of any importance. This might be of significant influence for the wider acceptance of the idea of personal responsibility for preventable fire. If the individual having a fire were called upon to explain the circumstances so that responsibility might be fixed, instead of being regarded as an unfortunate victim of circumstance, there would be a powerful incentive towards having fewer fires.

In the case of fires causing loss of life, coroners' inquests should fulfill the function of determining the circumstances and responsibility, but all too frequently such proceedings appear merely perfunctory, probably because the coroner has neither the technical background for the investigation of fires, nor sufficient interest in the subject to call in technical assistance. The recent handling of a case in San Diego by Coroner Chester D. Gunn presents an example of intelligent procedure. Two men were killed in an explosion which occurred on August 8 while beer tanks in a brewery were being waterproofed with a compound thinned with gasoline. There was some question as to the facts and responsibility, so Coroner Gunn called in a committee of technical experts, consisting of George F. Prussing, Safety Engineer of the Union Oil Co. of California (member N.F.P.A.), and his friends Mr. Ray Edwards and Mr. C. E. White of the San Diego Consolidated Gas and Electric Co. Their report clearly established the circumstances of the case, and stated:

"That the fire and explosion might have been avoided by any one of the three following precautions:

"1. Use of a high flash point solvent.

"2. Adequate forced ventilation . . . to prevent the accumulation of an explosive mixture. . . .

"3. Ordinary care in eliminating obvious sources of ignition."

* * * * * *

The Legal Adoption of Fire Rules. Nationally recognized standards on fire protection, such as developed by the N.F.P.A. and similarly established standards on other aspects of public safety, give to cities a basis for municipal regulation which is technically correct and is accepted as reasonable by all concerned. For a city to develop its own standards independently is not only a wasteful duplication of effort, but due to local political influence and lack of expert technical guidance, is likely to produce a result much less satisfactory than the adoption of a nationally recognized standard. The municipal authorities in many communities recognize this, and lean towards the adoption of national standards, with such supplementary ordinances as may be necessary to cover purely local conditions. Legal complications, however, place difficulties in the way of this logical and desirable procedure.

A blanket adoption of standards by reference is generally considered illegal on the ground that it constitutes an unauthorized delegation of legislative power. A method of accomplishing this purpose, which has been found legal in reference to the National Electrical Code, is to adopt legislation merely specifying that installations shall be made in a safe manner, and making the national standard *prima facie* evidence of safe installation. This plan, however, may not be generally applicable, and appears to be workable only

where there is a suitable personnel carefully organized for the enforcement of the particular legislation.

Adoption of a specific edition of a standard, as distinguished from blanket adoption to include all future revisions, is always legal if the procedure specified by law for the adoption of ordinances is followed. This commonly requires the publication of the entire text, usually in several issues of local newspapers, a procedure designed to give the public due notice of proposed legislation, but prohibitively expensive and altogether unnecessary in the case of national standards which are already in print and a matter of common knowledge to all those directly concerned. It is a well-established fact that many communities have refrained from adopting desirable fire prevention legislation merely because funds are not available for printing.

A solution of this difficulty is found in the enabling act which has been in effect in California for several years. This provides that national standards on certain phases of public safety may be adopted by any community by merely publishing a notice of the adoption and placing a specified number of copies of the printed standard for public reference in the headquarters of the municipal government. Acting upon this authorization the N.F.P.A. Suggested Ordinance on Flammable Liquids and other safety standards have been widely adopted by California municipalities, including many small communities which could not otherwise have secured adequate local legislation on the subjects covered. Every new edition of a national standard thus adopted requires filing of copies in the city hall and publication of a notice thereof, but once the routine is established this procedure involves no difficulty. A somewhat similar plan is followed in some other places, such as in Cincinnati, where various national standards are adopted by reference to the building code. The general adoption of this plan, with the enactment of suitable state enabling laws, would seem to point the way towards a much needed improvement in municipal legislation on fire safety.

While the enactment of suitable legislation is of first importance, it must be remembered that the enforcing official, rather than the law, is the determining factor in the result. Experience shows that a competent, honest and courageous official can get good results even with a meagre basis of legislation, and that no matter how good the law, satisfactory results are not to be expected if the enforcing official is incompetent or dishonest.

Cigarette Scorches.

The article on this subject appearing in the last issue of the QUARTERLY (July, 1935) quoted from recent court decisions of a nature to encourage the belief that claims for damages from cigarette scorches were likely increasingly to be denied. More recent legal decisions, one of them by a state supreme court, tend however to shatter the hope that these small claims are to be so easily discouraged unless the form of insurance policies is altered to exclude them.

The supreme court decision was rendered in Rhode Island in two cases, Davis Swerling vs. Connecticut Fire Insurance Co., and the same plaintiff against the Home Insurance Co., which came before the Supreme Court on agreed statements of facts. The court decided against the defendant companies on the ground that the burning cigarette on the rug was not a fire in the place where it was intended to be and that therefore it was then a "hostile" fire and the damage caused by it recoverable under the policies. The opinion, delivered by Justice Condon, is in part as follows:

Question Before Court.

"The question of law raised by the agreed statements of facts involves the damage done to a rug by a lighted ciagrette, which rug is part of a lot of household personal property belonging to the plaintiff and insured under two policies of fire insurance. The specific question raised is whether a lighted cigarette lying on a rug directly beneath an ash tray or smoking stand, so-called, is a fire within the meaning of that term as used in the standard fire insurance policy of the State of Rhode Island.

"The policies issued to this plaintiff were in standard form and insured him against 'all direct loss or damage by fire, except as hereinafter provided.' Damage done by a lighted cigarette is not expressly excepted by any proviso in the policies. The parties are agreed that while said policies were in full force and effect, the plaintiff observed the smouldering ashes of a lighted cigarette which were lying upon a rug and beneath a smoking stand or ash tray; that upon removing the ashes, it was found that the nap of the rug had been destroyed over an area about one and one-half inches long and one inch wide. The total damage is $36.

Contention of the Defendants.

"The defendants contend that this damage is not covered by the policies and that the plaintiff must prove that his damage is the result of a fire separate and distinct from the burning cigarette itself. On the contrary, the plaintiff says that the lighted cigarette was a hostile or unfriendly fire and that damage to the rug from the fire in the cigarette is recoverable even without showing that there was a separate and distinct fire in the rug."

The opinion states that while there is no identical case in a court of last resort, the defendants urge that the case is ruled by the principles laid down by this court in Solomon vs. U. S. Fire Insurance Co., 53 R. I. (1933), 154. In that case claim was made for soot damage resulting from a furnace pipe becoming disconnected and "the court found that there was only one fire which was intentional and within the place where it was intended to be and held, therefore, that no recovery could be had."

"The court applied the rule laid down in the leading English case of Austin vs. Drew, 4 Camp. 360, where it was said, as there was no fire, except in the stove and the flue, as there ought to have been, and the loss was occasioned by heat, there could be no recovery. It was further said by Biggs, C. J., in that case, that the fire was never excessive and always confined within its proper limits and that, had the fire been brought out of the flue and anything been burned, the insurance company would have been liable. This is the fundamental reason of that decision, and it has been generally followed by the courts of this country.

"We think the rule laid down in Austin vs. Drew, supra, is the correct one, but the difficulty in the instant cases is to determine whether or not the facts of the cases are sufficiently analogous to bring them within the rule. All of the cases which have applied the doctrine of Austin vs. Drew, supra, including our own case of Solomon vs. U. S. Fire Insurance Co., supra, had to do with a fire in a furnace or some other receptacle intended for it. In the instant cases we have a special and peculiar fire, a lighted cigarette not intended to be confined and burned in any fire-resisting container."

The court did not agree with the contention of the defendants: "In the Solomon case the damage was caused by a fire intentionally lighted within the furnace; in the cases at bar the damage was caused by a fire intentionally lighted within the cigarette. In both instances we have a friendly fire. In other words, there is no evidence that any fire existed outside of the cigarette."

Friendly or Hostile Fire.

The opinion continues:

"It is not sufficient to say that the only fire was in the cigarette and hence where it was intended to be. The cigarette was not the container of the fire. It was the fire itself. The whole cigarette was as much the matter to be consumed as the coal or oil in a furnace. If while the cigarette is lighted, the person desires to put it aside temporarily, or to discard it, he may put it in an ash tray or some other suitable receptacle. The burning cigarette is then confined in a place where it is intended to be. As long as the cigarette remains there, the fire in the cigarette is a friendly fire, and, for any damage it might cause while in its proper place, there can be no recovery. But, if through accident the cigarette gets on the floor and causes damage to a rug by charring or scorching it, the fire in the cigarette is no longer a friendly fire, but is a hostile one, because it is then in an improper place, and, therefore, is doing harm.

"Manifestly in Austin vs. Drew, supra, and the cases in accord therewith the friendly fire, intentionally started or placed in a container and remaining in its proper place, was the only fire, and it was correctly held that there could be no recovery in the absence of proof of a second fire, which, though it may have been caused by the first fire, was otherwise independent of it. Out of those cases has come the doctrine that to establish liability for damage to property originating from a friendly or intentional fire, proof of a second fire is necessary.

"The defendants insist upon the application of this doctrine in the instant cases, and urge that 'in the absence of proof that the damage is caused by a fire other than that of a burning cigarette, there can be no recovery.' In other words, the plaintiff must prove that his damage is the result of a fire separate and distinct from the burning cigarette itself. We do not deny the soundness of the rule laid down in Austin vs. Drew, supra, but we do not think the facts of the instant cases call for its application as urged upon us. Before applying the rule, we must first inquire whether the burning cigarette, in its position on the rug beneath the smoking stand, was in the place where it was intended to be and was therefore a friendly fire. If not, then it was a hostile fire, and damage caused by it to the rug is recoverable under these policies.

"In the instant cases, the burning cigarette was unquestionably a friendly fire, originally. In some unknown manner it got upon the rug * * *. In whatever manner, unless by design of the assured, it got where it did not belong, it became a hostile fire, although it was the same burning cigarette that a moment before was a friendly fire. The change in the locus of the fire changed its character; it then became 'a fire out of place,' so-called, and 'a fire out of place' is a hostile fire. Collins vs. Delaware Insurance Co., 9 Pa. Super. Ct., 576 (1898); Hartford Fire Insurance Co. vs. Armstrong, 219 Ala. 208, 122 So., 23 (1929) * * *.

"In the cases before us we have a burning cigarette on a rug causing damage to the rug by scorching or charring it. There is no claim that there was a second fire in the rug itself. The issue is simply whether the burning cigarette on the floor is an intentional fire in the place where it was intended to be. The origin of the fire is not in dispute, but the locus of it is. It becomes necessary to rule as a matter of law whether a fire in a burning cigarette on the rug, not intentionally placed there by the insured, is a fire in place or a fire out of place. It seems to us that there can be only one reasonable answer to this question and it is this, that under the circumstances the burning cigarette on the rug was not a fire in a place where it was intended to be and that, therefore, it was then a hostile fire, and the damage caused by it to the rug is recoverable under the policies."

In April, 1935, while the above case was pending before the Supreme Court of Rhode Island, Sidney Clifford of Providence wrote an article which was submitted to the section of insurance law of the American Bar Association at Los Angeles on July 17. A week after this the decision in the Rhode Island case in favor of the plaintiff was handed down.

The article by Mr. Clifford is in part as follows:

Increasing Number of Claims.

"With the increasing use of the cigarette has come a large number of claims for damage to personal property, such as furniture, draperies and table linen, caused by lighted cigarettes accidentally coming in contact with such property when covered by the ordinary fire insurance policy against direct loss or damage by fire. In practically all such cases there is seldom any evidence of a fire other than a scorched or burned appearance, but in order to retain the good will of policyholders, many claims for such damages are paid by the insurers, particularly when the amount claimed is too small to be made the subject of litigation. In recent years, however, the number of such claims in the aggregate represents a large amount of money, and fire insurance attorneys are constantly being asked whether such losses are within the terms of the standard policy.

"In the last analysis each case must be determined by its particular facts. Obviously liability for the loss depends entirely upon whether the damage has been caused by 'fire' within the meaning of the policy.

Meaning of "Fire."

"What is meant by the word 'fire' in a fire insurance policy; that is, what is intended by such use of the term? It must be conceded that the parties to a fire insurance contract do not intend to employ the word in some unusual or technical sense, and it must be conceded that they are using it as it is used in the common and everyday transactions of life. Any standard dictionary will in effect define fire as combustion accompanied by visible flame, and it will probably be conceded that the average insured seeks to be protected against loss from such a force.

"It is elementary, of course, that there can be no recovery if the insured intentionally burns the insured property (see Schmidt vs. N. Y., etc., Ins. Co., 1 Gray, Mass., 529; Kane vs. Hibernia Ins. Co., 39 N. J. L., 697; Names vs. Dwelling House Ins. Co., 95 Ia.,

642). In other words, the fire which causes the damage must be accidental in so far as the insured is concerned.

"The authorities and principle involved are discussed in detail by Edmund H. Abbott, Jr., in 24 Harvard Law Review, where the author says, at page 124:

" 'Fire, then, as used in an insurance policy, implies accidental combustion, accompanied by visible flame or glow. Each ingredient is essential. Flame or glow, as an element of combustion, is essential because flame or glow is the earmark of the phenomenon known in common speech as fire. But the word "fire" is also modified by the circumstances under which it is used in the policy. The contingent nature of the contract is a controlling circumstance in its construction. The circumstance cuts down the general word "fire" to "fire which is accidental with respect to the insured." The nature of the contract renders this accidental ingredient essential. Unless, therefore, the accidental quality and the glow or flame quality co-exist in the proximate cause of the injury, there can be no recovery under a fire policy.'

"From the above it is clear that a lighted cigarette is a fire in the dictionary sense, and when lighted by the smoker for its normal, intended use, it is not a fire within the terms of an insurance policy, because it is intentionally lighted. Accordingly, any damage such as scorching of property caused by a cigarette is not damage caused by an accidental fire or by fire within the meaning of a fire insurance policy.

"Of course, it is obvious that a cigarette intentionally lighted, like any other fire intentionally lighted, may ignite property not intended to be burned. In such case, however, a second fire comes into existence, which is not intentional, but is accidental, and damage caused thereby is within the scope of a fire insurance policy. Moreover, the real difficulty is to determine the question of fact whether a second or accidental fire existed and caused damage to the insured's property.

Distinction Between Friendly or Intentional Fire and Hostile or Accidental Fire.

"The difficulty of determining whether particular damage has been caused by an intentional fire or by a second and accidental fire has arisen in a variety of cases other than the so-called cigarette cases, particularly where the damage has been caused by smoke, soot or excessive heat from the intentional fire without any evidence being produced to show a second or accidental fire. The various cases, beginning with Austin vs. Drew (4 Camp., 360, 1816), are reviewed at length by Mr. Abbott in his article previously cited, and are also referred to in the recent case of Solomon vs. United States Fire Insurance Co. et al, (53 R. I., 154, 1933).

"In the Solomon case the court had before it a loss caused by soot emanating from an oil-burning furnace, in which an excessive amount of oil had collected and had become ignited. The court discusses the distinction between a so-called hostile and friendly fire, calling the former an accidental fire and the latter an intentional fire, and then decides that the damage in question was caused by an intentional or friendly fire.

"In applying the principles and decisions above mentioned to the so-called cigarette cases, it is obvious that although a lighted cigarette may be an intentional or friendly fire, it may or may not cause a hostile or accidental fire. In other words, in each case it must be determined whether the burning cigarette ignited the insured property, so that there was accidental combustion accompanied by visible flame or glow. The difficulty in determining such fact is usually increased by the fact that the damage is not discovered until the cigarette which is accidentally placed upon a piece of furniture, tablecloth, rug or other article burns out, and the only way of determining whether the insured property was ignited is by the inspection of the damage done.

"One will readily admit that a cigarette scorch on a dining room table is caused by heat from the cigarette rather than by any ignition of the table itself, but one cannot be

quite as sure in determining whether a lace curtain or doily is damaged by heat from the cigarette or by actual ignition caused by the cigarette. Accordingly, it is quite probable that no matter how any one court may decide a particular case, the decision will be of little use in another case based upon similar facts, until it is definitely determined whether or not the damage was caused by a second or accidental fire."

A Suggested Remedy.

The writer cites two cases to lower courts (Shear vs. National Liberty, People's Court, Baltimore, and Vass vs. Girard F. & M., Common Pleas of Cabell County, W. Va.), as showing the importance of determining the facts in each case, and concluded:

"If each case is to turn on a close question of fact, the opportunity for fraud is at once apparent, for what is easier than to have an insurance company pay for a piece of furniture by 'accidentally' causing damage thereto by a lighted cigarette?

"The situation is one which is bound to be a continuous source of annoyance to insurers, chiefly because of the trivial amount of a particular loss and because of the large number of such losses creating a surprisingly large total of money. A suggested solution is that an endorsement be placed upon the standard policy to the effect that losses up to $50 or $100 caused by lighted cigarettes will not be paid. Also such losses could be eliminated entirely, unless an additional premium be paid. Unless some such step is taken, it is obvious that there is unlimited opportunity for petty fraud, and insurers will continue to be annoyed by troublesome questions of fact in connection with such losses, which will mean either expensive litigation or an increasing amount paid in settling such claims."

It is natural that the recent disposition of several insurance companies to contest the payment of claims for cigarette scorches should be attracting rather wide attention in the insurance fraternity. As a result facts are emerging which indicate a variation in the gravity of the situation between various regions of the country. The following comment on the subject occurred in an August issue of the *National Underwriter:*

Decision Not to Affect Methods in the West.

The recent decision of the Rhode Island supreme court, holding the insurance companies liable for loss caused by cigarette burns, will not affect the policy of the companies, in the West at least, towards the handling of cigarette scorch claims, according to insurance leaders in the West. They believe that the Rhode Island decision will not be of such effect as to require insertion in the policy of a clause eliminating liability for cigarette scorch damage.

A few years ago when the attention of the business was being directed at the cigarette scorch problem, it is estimated the companies in the western territory were paying about $1,250,000 for losses of this type. Reform was needed, because the public was being educated to make claims of this sort and the companies realized there was no limit to the proportions that these frivolous claims might reach. Accordingly, there was an organized movement to deny liability to loss of the scorch type. Unless there were an active blaze and luminosity, there could be no recovery. This policy was successful from the start and was made effective without incurring the hostility of agents or policyholders. As a result, payments on account of losses of the cigarette burn type in the West amount to only about $250,000 a year. These are losses due to actual burns.

Observers note that the Rhode Island decision did not touch on the question of whether the policy provided coverage against scorch damage as contrasted with real fire loss. That decision concerned itself with whether the occurrence of a cigarette coming in contact with furniture, upholstery, etc., constituted a friendly or a hostile fire. The insurance people never contended that this is a friendly fire. What they contend is that it

was no fire at all. They contend that scorch caused by cigarette is no different from other types of scorches for which there is no indemnity, such as hot vessels, causing damage to table tops, electric lights in closets discoloring clothes, heat from stoves scorching the wainscoting.

This somewhat complacent attitude of the Middle West toward the problem is not that of Canada, where the increase in cigarette fires has been mounting in a fashion to disturb the Dominion insurance fraternity. According to tabulations issued recently by the Dominion Fire Commissioner, J. Grove Smith, and reported in the *Financial Post* of Toronto the returns show a new high peak of fires attributed to "smokers' carelessness," which are known in the trade as "cigarette" claims. In 1934 the number of these fires soared to a new all-time record of 12,844. The corresponding figure in 1933 was 9957. Property loss from this cause was $2,200,000 in 1934 and $1,800,000 in 1933. Excluding fires for which the cause was unknown, the number attributed to this cause represented 37 per cent of all fires reported in 1934. Considering property losses, fire from this cause was responsible for 8.5 per cent of the total of just over $25,000,000, while when the loss from fires of unknown causes is substracted smokers were responsible for 14 per cent of the total. The importance of these losses from the insurance viewpoint is indicated by the fact that the average amount of such fires amounted to only $168. The corresponding figure for 1933 was $185.

Canadian Insurance of September 3, 1935, has this to say on the subject of Cigarette Scorches:

Attempt to Curb Menace of Trivial Claims in Canada.

A determined attempt is being made by about five insurance companies with head offices for Canada in Montreal to combat the so-called trivial claim arising out of cigarette scorchings and other causes, according to a company official. Early this year a clause was inserted in policies of these companies specifically excluding burns from cigars, cigarettes, tobaccos or hot irons. Some companies are issuing a $50 deductible clause.

"This year, of course, we feel no benefit of the clause, but within a year or so we believe that the majority of our claims will arise from legitimate fires," said this manager, "and in a few years we hope that the trivial claim problem will cease to exist so far as we are concerned."

He thought that it may be necessary to be even more courageous and insert clauses which will also eliminate trifling claims made on chimney fires or from fires arising from children playing with matches.

The experience of the province of Quebec is worse than that of any other part of the Dominion as regards claims from cigarette and pipe scorchings. "We receive more trivial claims from one town in the province of Quebec than from the rest of the entire Dominion," this manager declared. When asked the reason, he said that in this town and district were agents of various companies who had so instilled the trivial claim idea when selling fire insurance that the policyholders claimed on the slightest pretext. Some claims had been received from this town for as low a sum as 75 cents. Througout the entire Dominion, 75 per cent of the fire insurance claims received were trivial.

Public Reaction to Clause.

"How does the public react to the policies with the clause which prevents them from claiming should they have cigarette burns or scorchings in their homes?" we asked.

"The public does not take to it kindly, although fair-minded policyholders admit that it is high time that insurance companies protected themselves against the cigarette scorching racket," was the reply. "We get two out of five policies returned because of the clause. The reason is that some agents of other companies inform the insuring public that their company does not do that. The prospect then returns the policy, frequently stating that Mr.——, agent of such and such a company in his town, states that his company will gladly pay all such claims. At present we are losing business, but under the existing conditions we are willing to do so. In a few years we believe that we will reap the benefit of this clause. Some companies have got to be courageous enough to combat this so-called trivial claim evil. Perhaps one of these days all the companies will fall in line and fire insurance will not be sold on the basis of claim-for-anything, 'my company will stand for it.'"

Policyholders who have not yet had to renew and thus take the policy with the clause barring these trivial claims have evidently heard that soon cigarette scorchings will cease to be met by their company. This executive continued: "As their existing policies are expiring they appear to have largely got the idea that if they want to make a claim for a cigarette scorched article it is a case of now or never. Claims of this nature are inundating us from those districts where most of the new policies with the clause inserted are being sold. We are willing to suffer this deluge of claims and also are willing to have about two out of five policies returned because of the clause, in the hope that we five or six companies will later be looked upon by the other companies as pioneers seeking to put the fire insurance business on a legitimate and workable basis in Canada. We hope in a year or so to get the public accustomed to the clause so that other companies will fall in line. We hope to make it impossible for agents to advise policyholders to claim for trivial things, whether it is a fire which comes under the terms of the policy or not. The fire insurance business has reached such a state with trivial claims and fake claims that we feel it would be better to go out of business in Canada altogether if we cannot put it on a proper and paying basis. Competition is so keen today that the policyholder has been taught to make claims which should never be made, and the agent who fosters the idea and the policyholder who acts on his advice are undermining the business so badly that we have at last faced the problem fairly and squarely by inserting the above mentioned clause. We are losing a large volume of business which is going to other companies who will pay without investigation trivial claims from $1 up to $25 or more, which should not rightly be paid under the terms of the policy. Our attitude in sitting at our desks in Montreal and seeing two out of five policies returned will, we believe, be rewarded. If it is not, and the other companies do not fall in line as regards paying trivial and unfair claims, but use this condition as a sales argument to sell their own policies, then we will have to go out of business. We are putting up a silent fight for what we think is right. A year or so will tell us whether the fight is being won or lost."

In the issue of the *Weekly Underwriter* of September 7th William H. Rodda (Member N.F.P.A.), manager of the South Atlantic Adjustment Co., comments upon policy contracts and the recent court rulings in cigarette scorch cases and furnishes a table of experiments conducted by him to determine under what conditions actual ignition occurs. Mr. Rodda says:

It has been the writer's experience that where there is a burn beyond the cigarette to such an extent that it could have been caused only by actual ignition, that the companies will recognize it as a fire claim and make an adjustment. It is clear, however, that in between the slight scorch caused by the heat of a cigarette and the definite ignition of a piece of goods, there are many border line cases that must be decided.

In order to have some basis on which to handle these claims the writer has made a number of experiments with burning cigarettes under actual observation, and then applied the results to the established rule on friendly fires and the few legal decisions available regarding cigarette burns. The observations made and the conclusions obtained should be of value to adjusters and agents alike when confronted with one of these troublesome claims. Since so many of these claims are small in amount they are often left to the agent to deny liability. This must be done carefully and with a full knowledge of the facts in order to prevent the assured from feeling that the company is taking advantage of him.

Fire Insurance Policy Coverage.

The fire insurance policy contract insures "against all *direct loss and damage by fire*..." The assured generally has no knowledge of the difference between a "friendly fire" and an "unfriendly fire." To him the insurance company should pay for any damage resulting in any way from fire. The courts, however, have generally interpreted the policy to mean loss and damage by a fire which is accidental as to the insured person.

A fire confined to the limits intended for it has been construed as a "friendly fire" even though it may cause damage. Thus damage done by an overheated stove when there was no fire outside the stove has been held as not covered under the fire insurance policy. Likewise smoke damage from a faulty oil burner has been denied as a fire insurance policy loss.

Just recently, however, the Court of Appeal of Louisiana failed to follow the hitherto well-established rule. In the case of Salmon vs. Concordia Fire Insurance Co. of Milwaukee, 161 Southern 340, the court allowed the assured to recover for jewelry lost when thrown into a trash burner and destroyed. The court took the position that since the policy covered "all direct loss or damage by fire," and did not distinguish between a "friendly" and an "unfriendly" fire, that the loss was included in the coverage. This further confuses the already badly jumbled situation regarding cigarette burns.

Court Rulings.

There are very few court decisions applying to cigarette burns and only one of those available up to the present has been appealed to the higher courts. Most of the cases available have had decisions based principally on whether the article damaged was ignited. In a case at Toronto, Ontario (Osborn vs. Federal Fire Insurance Company of Canada) His Honor John MacDonell in rendering his decision stated in part, "I have reached the conclusion that the hole in the table cloth could not have been formed unless there has been an ignition of the table cloth." On that basis the decision was granted to the plaintiff.

In two other cases (Shear vs. National Liberty Insurance Company in the Peoples Court of Baltimore and Vass vs. Girard Fire and Marine Insurance Company in the Court of Common Pleas of Cabell County, West Virginia), the courts decided in favor of the insurance company without rendering an opinion. Apparently they were convinced that no fire had occurred as intended by the policy. It is reasonable to expect that most courts will follow the rule of "friendly" fires and decide that where the damage was caused entirely by the heat from the burning cigarette without having set a secondary fire there is no fire within the meaning of the policy.

However, a decision recently handed down by the Rhode Island Supreme Court follows the interesting reasoning that the cigarette is not the container of the fire, but the fire itself (Swerling vs. Connecticut Fire Insurance Co. and Home Insurance Co.). Therefore, when the burning cigarette gets onto a place where it is not intended to be, it is a hostile fire. The case in point was one where a cigarette had dropped from an ash tray on to a rug. There is no indication as to how this court would interpret a case where a cigarette was laid on the edge of a table and eventually burned up to the table without being moved from its original position. It is hard to see how a court would allow recovery if

the assured himself put the cigarette there, but the court might hold the damage was accidental as to the assured if some other person put it there.

If a considerable number of courts follow the Rhode Island decision, it will be difficult to combat any cigarette claim with the present policy wording. In any case, it is important to know whether a secondary fire has been set or whether the entire damage was caused by the fire within the cigarette itself. The following table shows the results of a series of experiments made by the writer in order to learn with what type material and under what conditions a secondary fire is started by a burning cigarette. Various materials were used and placed on wood, cotton and fabric backings in order to simulate actual conditions of use.

Experiments With Cigarette Burns.

Cigarette burn experiments to determine under what conditions actual ignition occurs:

Material	Backing	Secondary Glow	Extended Beyond Cigarette	Condition Afterward
Heavy Linen	Wood	No	No	Charred
Fine Linen	Wood	No	No	Charred
Fine Linen	Cloth Pad	With a breeze	No	Ash
Linen Dress Goods	Cloth Pad	Yes	Yes	Ash
Cotton Lace	Cloth Pad	Yes	No	Ash
Cotton Lace	Wood	No	No	Charred
Cotton Jaspe	Cotton Stuffing	Yes	Only with breeze	Ash
Rayon	Cloth Pad	Slight	No	Charred
Tapestry— Fine Weave	Cotton Stuffing	Yes	Considerably— Backing ignited	Ash
Tapestry— Coarse Weave	Cloth Pad	No	No	Scorch
Cretonne	Cloth Pad	Yes	Slightly	Charred
Velvet	Cloth Pad	Yes	Yes	Charred
Silk Crepe	Cloth Pad	No	No	Charred
Wool (Suit Material)	Cloth Pad	No	No	Scorch
Cotton Napkin	Cloth Pad	Sometimes	Sometimes	Ash or Charred
Varnished Wood		No	No	Scorch
Painted Wood		No	No	Scorch
Unfinished Wood		No	No	Scorch

It will be noted that the cloth caught fire and glowed in the majority of cases. In six out of 15 cases the glow extended beyond the line of the cigarette and in one case flames resulted. A very slight current of air was sufficient to cause much more active combustion. The presence of cloth or cotton underneath aided combustion compared with that secured over a wood backing. In no case did a piece of wood ignite from the cigarette. Occasionally the backing of either wood or fabric would be scorched by heat coming through the top fabric when the top piece itself was merely scorched and did not ignite. In order to determine whether a piece of material has been ignited, its condition can be compared with the results shown in the last column of the table. With woodwork it is usually evident when the damage is really only a scorch. Where a piece of damaged cloth remains whole and is scorched or even charred, the chances are that there was no glow. Where the char extends beyond the cigarette or the material has been reduced to ash, there can be no doubt that there was a glow. But scorched or charred cloth breaks away easily with handling and the existence of a hole is not conclusive evidence of a glow having occurred.

Since a visible glow as the result of combustion is considered a fire (the same as a flame), it appears that the policy and the courts will allow recovery where there is either a glow or a flame. The benefit of a doubt is given to the assured rather than to the com-

panies and one can hardly avoid the conclusion that the companies will have to pay many of these cigarette burn claims.

Suggested Solutions of the Problem.

The present method of depending on the "friendly fire" doctrine is generally unsatisfactory and particularly of little value in Louisiana and Rhode Island. In addition it is not based on any specific wording in the policy or form and often leads to bad feeling on the part of the policyholder. Probably the ultimate solution of the problem will be a change in either the policy or the form.

One possible method would be to endorse the policy to the effect that "In consideration of the rate at which this policy is written, it is understood and agreed that scorches or burns caused by lighted cigarettes, cigars, or pipes are not covered by this policy." The endorsement would need to be very carefully worded in order to exclude the type of burns intended and still cover an actual fire. For the policyholder who insisted on cigarette burns being covered an extra charge could be made.

Another way of meeting the problem would be to attach a deductible clause or a limitation clause to the form. The former, of course, would provide for the assured to pay the first twenty-five or fifty dollars of any loss, while the limitation clause would provide that no loss of under a stated amount shall be paid, but losses of over that amount shall be paid in full. The limitation clause is used in many places on windstorm policies. It offers perhaps one of the best possibilities of eliminating the troublesome small losses without penalizing the man who has a real catastrophe.

It would seem reasonable to conclude that sooner or later the pressure of enlightened opinion, within the fire insurance fraternity and without, will result in such changes in the policy contract as will protect the companies, and through them the public, from these petty claims and the disproportionate expense of adjusting them, unless it be that there may come to prevail in the fire insurance business the practice now operative in automobile insurance that the first twenty-five or fifty dollars of every loss from whatever cause shall be paid by the person insured. There would seem to be nowhere any justification of the assumption that the handling of such a multitude of petty transactions is profitable either to the insurance companies or to society.

The Detroit Fire School Explosion.

Assistant Chief Archie McClellan of the Port Huron, Michigan, Fire Department was fatally injured and some forty-two others were burned and cut by flying glass in an explosion in the Smoke Room of the Detroit Fire Department Drill School on July 31, 1935. The explosion occurred during a demonstration before a group including many fire department officers from various points in Michigan in connection with the Sixty-First Annual Convention of the Michigan State Firemen's Association and the Seventh Annual Fire College.

After a program of drill evolutions and demonstrations on the morning and afternoon of July 31, at about 4 P.M. a demonstration to show the action of a carbon dioxide smothering system in extinguishing fire in flammable liquids was staged by the local representative of a manufacturer of carbon dioxide fire extinguishing equipment.

The arrangement of the smoke room is shown by the accompanying diagram. The east window, shown in this sketch, looks into the apparatus room of the station. This observation window was substantially constructed with steel frame and wired glass set in the inside.

The demonstration was being witnessed by approximately two hundred persons, practically all of whom were on the inside of the building, observing it through the east window. The temperature in the room was estimated to be about 90° F. The demonstrator poured a quantity of gasoline into a galvanized pan two feet by three feet by two and one-half inches deep, weighing eight pounds when empty. This pan was in the center of the floor in such a position that none of the carbon dioxide nozzles pointed directly at it. The average distance from the pan to the nozzles was about five feet. After pouring the gasoline into the pan the demonstrator left the room and gave a brief explanation of the manner in which the carbon dioxide system was supposed to function. After this he re-entered the room and poured an additional quantity of gasoline into the pan, making the total amount, as estimated by him, one quart. The total time elapsing from the time gasoline was first poured into the pan up to this point was estimated by the demonstrator and others to be between two and three minutes. An assistant then entered the room, struck a match on the floor alongside the pan and tossed it into the pan, igniting the gasoline. He stepped out of the east door of the room, closing it behind him.

NOTE: This article is extracted from the official report signed by William E. Dowling, Assistant Prosecuting Attorney for Wayne County, Michael McGowan, Detective Sergeant —Homicide Squad Detroit Police Department, Geo. W. Smith, Detective Lieutenant—Arson Squad, Detroit Fire and Police Departments, and G. S. Goldwater, Fire Marshal, Detroit Fire Department.

In the meantime, the demonstrator had taken a position just outside the east door at the northeast corner of the room in order that he might observe the fire through the glass panel in the east door and have access to the manual control of the dioxide system. The flames rose some six to eight feet and were plainly visible to the spectators.

According to the demonstrator who timed the carbon dioxide system it functioned in about seven seconds, releasing the gas. About five seconds later the explosion occurred. However, witnesses disagree as to the time, some fixing it as long as two minutes from the time the gasoline was lighted until the explosion. The sprinkler system operated just prior to the explosion. The carbon dioxide and sprinkler systems retarded the flames to some extent, but did not extinguish them. Some observers stated the gasoline pan rose approximately two feet from the floor just prior to the explosion.

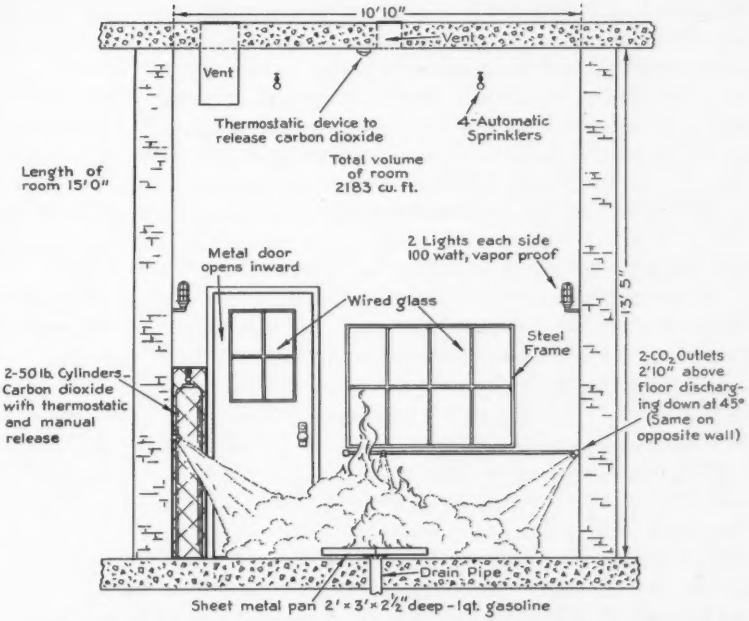
The blast forced out all the panes in the east window and the four corner panes in the west window and cracked two others. The glass was shattered and some small fragments of it thrown as far as seventy-five feet. It was followed by flames which projected out the windows some fifteen to twenty feet. As a great number of the spectators were within a few feet of the windows, forty-three of them were injured, being cut and burned, mostly about the hands, arms and head. The only fatality resulting was Assistant Chief Archie McClellan of Port Huron, Michigan, who died in Receiving Hospital August 15, 1935, at 5:10 P.M.

Investigation and Tests.

An examination of the room and equipment after the explosion disclosed that each window sash was bulged outward approximately five inches. The cast iron cover to the ceiling vent had been lifted by pressure and was lying upside down two feet away. The vent in the northwest corner of the room was not disturbed. The gasoline pan was moved from its original position, but it could not be determined at this time whether this was the result of the explosion or some person moving it afterwards. There was little evidence of fire in the room, except some indications of smoke on the ceiling and upper portion of the walls. The dioxide system had functioned, as was evidenced by both discs having been punctured by the cutter valves, releasing the contents of both cylinders. All four of the outer vapor proof globes and two of the light bulbs were broken. Indications were that these were broken by water from the sprinkler system contacting them while they were hot, rather than by the explosion, as the four sprinkler heads had all operated.

Statements were taken from the demonstrator, his assistant, a number of the injured and numerous other witnesses. None of them was able to furnish any information as to the direct cause of the accident.

The two dioxide cylinders used in the original demonstration were sealed and along with a sample of the gasoline used were shipped to the Underwriters'


10'10"
Vent
Vent
Thermostatic device to release carbon dioxide
4-Automatic Sprinklers
Length of room 15'0"
Total volume of room 2183 cu. ft.
Metal door opens inward
2 Lights each side 100 watt, vapor proof
Wired glass
Steel Frame
13'5"
2-50 lb. Cylinders Carbon dioxide with thermostatic and manual release
2-CO_2 Outlets 2'10" above floor discharging down at 45° (Same on opposite wall)
Drain Pipe
Sheet metal pan 2' × 3' × 2½" deep - 1qt. gasoline

The Smoke Room of the Detroit Fire Department, cross sectional view, looking east. The spectators were standing in the apparatus room behind the observation window shown in this diagram.

Laboratories for analysis. The analysis showed the carbon dioxide to be free from any combustible matter and the gasoline to be of an ordinary grade.

On August 13 a meeting was held at the Training School for further study into the cause of the explosion. Among those present were several chemists, engineers and other experts on combustion. After an examination of the premises and a study of the information available these gentlemen did not offer any conclusions. However, it was unanimously agreed that the running of some tests in which the original explosion might be duplicated, at least in part, might be enlightening.

Provisions for conducting tests were made by installing piping through the north wall of the room to accommodate the necessary pressure gauges and for collecting samples of gases from the atmosphere of the room in vacuum tubes during the tests. The window panes were replaced and the room put in practically the same condition as it was prior to the first explosion. A safety screen fitted with bullet-proof glass was placed a few feet away from the east window of this room as a protection for observers.

Several tests were made under varying conditions. In Test No. 3 the original conditions were duplicated except that only a pint of gasoline and one cylinder of carbon dioxide were used.

The gasoline in the pan was lighted and the doors of the room were closed. The carbon dioxide system operated in about thirteen seconds after the ignition of the gasoline. At this time the pan of gasoline was raised about four feet in the air and almost immediately thereafter there was an increase in the intensity of the flame and an explosion occurred, blowing out all the panes of the east window and the four corner panes in the west window and cracking two others as in the original explosion.

This test reproduced the original explosion, with the exception that the flames did not project as far out through the windows. The pressure gauge did not register any pressure, but other instruments indicated that there was a pressure of the order of 1½ pounds per square inch.

Conclusions.

Reports of their findings were submitted by the following, who participated in the conduct of the tests: A. H. Nuckolls, Chemical Engineer, Underwriters' Laboratories; Alfred H. White, Professor of Chemical Engineering, University of Michigan; Frank Burton, Consulting Engineer; Ormond Rugg, Chief Chemist, Glass Plant, Ford Motor Co.; H. H. Mills, Chief Safety Engineer, City of Detroit. The observations of Mr. A. H. Nuckolls are printed in full below; the comments of the others are similar, but less detailed.

"It appears from the foregoing that the explosion which occurred in the Smoke Room of the Firemen's Training School, July 31st, was caused by the combustion of gasoline. It was evidently a localized gasoline explosion of a low order. The vaporized gasoline at the moment of the explosion was not distributed throughout the room, a quart of gasoline being capable of rendering only about 400 cu. ft. of air flammable or explosive, but was concentrated in a mixture with air in a space probably near the center of the room. As would be expected under such circumstances, the pressure effect was comparatively low, being of the order of about 1 to 2 lb. per sq. in., which was sufficient to blow out the windows. The windows of ¼-in. wired glass were probably not capable of withstanding a pressure much, if any, above 135 lb. to the square foot.

"It may be inferred from a study of the flame phenomena observed when the explosion occurred during the demonstration July 31st that a considerable portion of the gasoline had not burned at the time the windows were blown out. The large amount of flame projected from the windows extending a horizontal distance of about ten feet, which severely burned several observers, was probably due mainly to vaporized gasoline and not carbon monoxide*

*Carbon monoxide is lighter than air, and at least 12½ per cent by volume is required to form a flammable mixture with air.

from the partial combustion of the gasoline. The conditions existing in a room containing 2200 cu. ft. of air and about a quart of gasoline would preclude the formation of such a large volume of carbon monoxide in such a short period of time even with carbon dioxide being rapidly discharged into the room. It appears therefore that the pressure effect which ruptured the windows was due to the combustion of much less than a quart of gasoline, probably about a pint. This inference is confirmed by the results of the third test in which the pressure effect was approximately reproduced by the combustion of about a pint of gasoline.

"It is clear that there was sufficient oxygen in the air for the combustion of the gasoline.† The dilution of the air by the carbon dioxide discharged into the room, near the floor level, during the small interval of time between the operation of the system and the explosion, was evidently not sufficient to retard combustion to any marked extent.

"The discharge of the carbon dioxide at high velocity from the six 5/32-in. outlets evidently caused a marked turbulence in the air of the room. In addition there was an upward movement of air and gas near the center of the room. This movement was probably at a maximum when the outlets were at an angle of 45°. Naturally gasoline in both the liquid and vapor phases was blown upward, with the result that the liquid was vaporized somewhat more rapidly, and the vaporized gasoline was rapidly diluted with air, forming a more combustible mixture and thus mechanically bringing about conditions which facilitated the communication‡ of the flame from the burning portions of vapor to the adjacent unburned portions. These conditions, being highly favorable to a sudden increase in the rate of combustion with resulting increase in the maximum pressure, appear to be the underlying cause of the explosion which occurred in the Smoke Room July 31st and also of the explosion reproduced in the third test.

"Other factors, including the elevated temperature produced by the burning gasoline prior to the discharge of the carbon dioxide gas and the small pressure rise caused by the combustion and the discharge of the carbon dioxide gas, contributed to the increase in the combustion rate, but the underlying cause, as indicated above, was the turbulence, together with the dilution of the gasoline by the air as it was blown upward.

"It is not thought that any minor difference in the conditions or in the time of operation of the release device would have prevented the explosion.

†Theoretically, 32 cu. ft. of oxygen would be sufficient for the combustion of a pint of gasoline. The room contained about 460 cu. ft. of oxygen at the start of the combustion. The partial pressure of the oxygen remaining after combustion would be 0.195, which is ample for combustion.

‡Turbulence in a flammable mixture increases the frequency of the effective collisions of the gas or vapor and air molecules and thus accelerates the combustion particularly in case of a lean mixture.

"The movement of the pan, containing the gasoline, upward undoubtedly caused a more rapid formation of the explosive mixture of gasoline vapor and air, thus contributing to the intensity of the combustion and the resulting explosion.

"It is generally supposed by firemen and others trained in practical fire prevention work that when the quantity of a flammable liquid, such as gasoline, is not sufficient to give enough vapor to form a flammable mixture with the air in an enclosure that there is little, if any, potential explosion hazard. It is not surprising therefore that the explosion hazard from the combustion of a quart of gasoline in the Smoke Room of the Firemen's Training School, the net capacity of which is of the order of 2200 cu. ft., was not recognized in advance. Further the two fire extinguishing systems were considered ample to cope with the situation. Thousands of demonstrations apparently similar to the one which resulted in an explosion have been safely conducted.

"It is clear that the essential conditions bringing about an explosion hazard in this case relate to the rapid dissemination of the vaporized gasoline in the air, together with a marked turbulence in advance of the formation of the non-explosive atmosphere by the discharge of carbon dioxide, a situation that is unusual and evidently complex in its nature."

Mr. Frank Burton made the following comment on the lifting of the pan: "When the carbon dioxide was released from the jets pointing down at an angle of 45° the various streams of gas met near the floor and were then deflected upwards, since each jet balanced the force of the one opposite to it. In consequence, the pan containing the gasoline was lifted bodily upwards and the burning gasoline was sprayed into the upper part of the room. Although some of the gasoline burned there must have been a portion of the gasoline which was vaporized in an atmosphere containing so much carbon dioxide that it could not burn. When, however, this reached the upper part of the room where the carbon dioxide content was lower and the oxygen content higher, there was a sudden combustion of the gasoline, resulting in an explosion."

EDITORIAL NOTE: The Regulations for Carbon Dioxide Fire Extinguishing Systems, developed by the N.F.P.A. Committee on Manufacturing Hazards and, after adoption by the Association, published by the National Board of Fire Underwriters in 1933, contain the following provision:

> 43 (b). Discharge outlets shall be designed to discharge the gas gently by reducing its velocity so that flammable liquids and other materials protected will not be displaced and so that air may not be drawn in by discharge devices to interfere with prompt extinguishment.

The Detroit explosion has not been construed as reflecting upon the value of carbon dioxide fire protection, or the safety of properly designed installations. It does illustrate most forcefully the importance of proper design of carbon dioxide systems in accordance with the N.F.P.A. regulations from which the above provision is quoted, and the danger inherent in fire demonstrations unless most carefully planned.

The Wooden Shingle Roof.

All of the members of the National Fire Protection Association undoubtedly realize the fire and conflagration hazard experienced for many years from the wooden shingle roof. However, it is quite possible that many feel that the hazard has been to a large extent dissipated and it is perhaps no longer of importance. In order to show that the hazard is still of considerable importance at various points on the continent the following information is presented.

Detroit.

The following table shows the experience in Detroit with fires on wooden shingle roofs for the past decade.

Year	Total Building Fires	Fires from Sparks on Wood Shingle Roofs	Per Cent of Shingle Roof Fires to Total
1925	7472	1123	15%
1926	6500	1208	18
1927	7399	1352	18
1928	8227	1588	19
1929	9303	1649	18
1930	7778	1660	21
1931	7435	1905	26
1932	6881	1802	26
1933	6864	2350	34
1934	8820	3537	40

We do not have in our records data on any other city that show as many fires from this cause in any one year as Detroit suffered in 1934.

In July, 1929, the City Council of Detroit appointed a Special Building Code Committee to consider a new building code for the city. The City Council has been recently considering the code and on this particular point in the code the Special Building Code Committee has filed a memorandum with the City Council, which is an able presentation of the situation in Detroit and the need for the adoption of provisions prohibiting wooden shingle roofs in the code. The memorandum is quoted herewith.

"Probably no provision of the code has been the cause of so much, or such violent discussion as this subject. At the start your committee was unanimously of the opinion that the use of wood shingles should be permitted. After a very detailed consideration of the subject during the course of nearly a year, we all came to the conclusion that the further use of wood shingles should not be permitted. During that time representatives of all the various interests involved were given an opportunity to discuss the question. The proponents of wood shingles appeared and presented a vast number of arguments, but were unable to satisfy the committee that wood shingles are a proper roofing material.

From 1900 to the time when this code was prepared, about $100,000,000 worth of property, mostly dwellings and small stores, has been destroyed in conflagrations throughout the United States, and in each case the fire was spread principally by burning wood shingles and other bits of burning wood being carried by the wind to other wood shingled

roofs, and then starting fires. The number of such fires has been relatively few, but the losses have often reached from $1,000,000 to $10,000,000 or more in a single fire. The facts of the method of spreading of these fires are disputed, but exhaustive field studies by the National Fire Protection Association and laboratory studies by the United States Bureau of Standards, leave no doubt in our minds that the prime and practically only cause of conflagrations sweeping out great areas of American cities, is due solely to the combustibility of wood shingle roofs.

In ancient times, as well as modern, in foreign countries as well as in America, whenever wood shingles or thatched roofs have been permitted in large cities, great conflagrations have been common, but when incombustible roofs have been the rule such disasters have never occurred, except as the result of earthquake. Most European cities have prevented the use of combustible roofs for centuries, and the larger American cities have effectively eliminated wood shingles by some method or other, until they are either entirely prohibited or severely restricted in New York, Chicago, Boston and many hundreds of smaller cities and towns.

During the burning of the apartment house on Gladstone Ave., near Linwood, a few years ago, not less than forty individual fires were started on wood roofs within a radius of about one-half mile. Fortunately there was no very great wind blowing or the number would have been hundreds. At the time the Fire Department was unable to move its apparatus because of traffic congestion. These fires were extinguished by firemen on leave, policemen, street car motormen, citizens with garden hoses and other volunteers. Without their aid and with a little more wind the fire loss might have reached millions. Our city is hardly justified in depending on such voluntary aid in so grave a matter. Incidentally the apartment house was a four (or five) story ordinary construction building in the process of erection, which had not yet received its ceiling protection.

In modifying the committee's recommended code to provide for the use of wood shingles, use was made of a provision copied from an appendix to the code of the National Board of Fire Underwriters. This provision was placed in the code only after a long and bitter dispute and under heavy pressure from the lumber manufacturers. It should be noted, however, that this provision in the underwriters' code applies only to buildings 12 feet from any other building with a similar roof. The 12-foot requirement has been omitted in copying, since it would entirely defeat the purpose. The provision also calls for vertical grain shingles. Such shingles have never proved satisfactory in making a watertight roof and we consider this provision unenforceable. Any serious effort to enforce this will quickly result in a demand upon you to amend the ordinance and omit this requirement.

Although the National Board of Fire Underwriters included this provision in an appendix to its code it must be remembered that whenever wood shingles are used the Board's regulations demand a premium, about one-third more for buildings having wood shingle roofs than for those with approved composition roofs.

The superior qualities of prepared roofings are now so well recognized by the public that thousands of citizens are covering over their leaky wood shingle roofs each year with prepared roofings as a matter of good policy. The Home Owners' Loan Corporation in making repairs requires this. Wood shingles are being used today only on new buildings, and then almost entirely by speculative builders. These facts are all well known to you and are stated simply to show that there is no inclination on the part of the public to refrain from using these products. The opposition comes partly from the builders who can save a little money by using wood shingles, but mostly from the manufacturer who is striving to retain his markets.

In its present condition our city is peculiarly vulnerable to conflagrations, due to the large number of wood shingle roofs. A serious fire on a windy day during a dry period

in the summer or fall might easily result in the loss of houses worth as much as $10,000,000 or $15,000,000. We might reasonably recommend legislation to require all these roofs to be protected now, but it is not our wish to appear drastic or ask more than we believe you will be willing to grant. We ask only that you start now to improve conditions on new buildings, trusting that the present tendency to cover old wood shingle roofs with prepared roofings will continue and correct the present condition in the not too distant future. We feel it our duty to call your attention to the very real danger that exists and to urge you to retain this provision."

Minneapolis.

Another large American city where the shingle roof has been prevalent and where we have made strong attempts to secure its legal elimination, so far without success, is Minneapolis. The shingle roof record in that city is presented in the following table.

Year	Total Building Fires	Fires from Sparks on Wood Shingle Roofs	Per Cent of Shingle Roof Fires to Total
1924	2043	863	42%
1925	2064	804	39
1926	1855	690	37
1927	1662	677	41
1928	1612	774	48
1929	1572	513	33
1930	1667	553	33
1931	1636	582	36
1932	1671	588	35
1933	1708	684	40
1934	1854	785	42

Although an ordinance calling for a more expensive grade of wooden shingle roof and specifying the method of application was enacted by the City Council of Minneapolis in 1926, this has not had to date any favorable effect upon the fire record. The claim is sometimes made that the fire department classification of fires due to sparks on roofs includes all types of roof covering and that many of these fires are caused by other than wooden shingles. The fire department in Minneapolis has for the past several years made a classification of all fires starting on the outside of roofs from sparks, brands, etc. This classification for last year shows that 785 of the fires were due to sparks on wooden roofs, 9 on composition roofs, 1 on tar and gravel roofs and 1 on tar-paper roofs. Figures for previous years show the same relative proportions.

Nova Scotia.

An interesting study of small fires throughout the Province of Nova Scotia, covering a period of seven years, has recently been made by Fire Marshal J. A. Rudland of the Province. Mr. Rudland felt that a study of fires where the loss was under $50 would give him certain useful information. It is relatively easy to determine the exact cause of these incipient fires, whereas in the case of larger loss fires the cause may be unknown. During the seven-year period in Nova Scotia, beginning in 1928 and ending in 1934, the total

number of fires was 8979, of which 3646 were with loss less than fifty dollars. The more important causes of these small loss fires are recorded below:

1st Sparks on Wooden Shingle Roofs	1371
2nd Carelessness with Matches and Smoking	558
3rd Chimneys and Flues	340
4th Stoves, Furnaces, etc	331
5th Electricity and Electrical devices	169
6th Sparks from combustion (other than wooden shingle roofs)	148

The overwhelming predominance of fires from sparks on wooden shingle roofs is the striking thing about the tabulation.

Building Codes and Fire Prevention Codes.

By Percy Bugbee and Horatio Bond.

Most of the cities in America have had some form of building regulations for a good many years. The development of a code of fire prevention regulations for cities has been, however, of comparatively recent origin. The development of fire prevention codes has paralleled the development of fire prevention bureaus in fire departments and the development of the idea that has spread so rapidly throughout the country during the past twenty years of utilizing fire departments as fire prevention as well as fire extinguishing agencies.

Nearly all of the larger cities in the United States and Canada today have organized fire prevention bureaus in their fire departments. For the most part these bureaus have been established within the past ten or fifteen years.

With the assumption of better control of fire hazards and better organized fire prevention work by the fire department there has grown up a certain amount of confusion and misunderstanding between the fire departments and the building departments, particularly in the larger cities, and it is the purpose of this article to attempt to define the functions of the building and fire departments and to suggest the content of building codes and fire prevention codes to demonstrate that with any reasonable degree of coöperation between these two important civic departments no conflict nor confusion need exist.

A good definition of the function of a city building inspector is the following, quoted from the building laws of the City of Providence:

"A building inspector is charged with the duty of executing the provisions of the building code, the rules adopted and made a part of the building code, and any ordinances or rules in amendment thereof and in addition thereto except as otherwise provided. He shall have the power to issue notices and certificates, to pass upon questions relative to the mode, manner or construction or materials to be used in the erection or alteration of buildings, to require that such mode, method of construction or materials shall conform with the true intent and meaning of the several provisions of the building code, and shall keep a record of his doings. He shall examine all buildings in course of erection, alteration or

repair as often as practicable and shall make a record of all violations of said ordinances and rules, together with the street and number where such violations are found, and the name of the owner, lessee, occupants, architect and master mechanics, and all other matters relative thereto, and shall report all such violations to the city solicitor or other proper officer for prosecution. He shall examine all buildings reported dangerous, whether from fire or from any other cause, and make a record of such examinations, with the name of the street and the number of the building, the name of the owner, lessee, and for what purpose occupied, and shall examine all buildings under application to raise, enlarge or build upon and make a record of the condition of the same."

The best definition of the powers and duties of a fire prevention bureau is contained in the model suggested ordinance establishing a bureau of fire prevention recommended by the National Fire Protection Association and by the National Board of Fire Underwriters. Its definition is as follows:

"It shall be the duty of the officers of the Bureau of Fire Prevention to enforce all laws and ordinances covering the following:

1. Prevention of fires.
2. Storage and use of explosives and flammables.
3. The installation and maintenance of automatic and other fire alarm systems, and fire extinguishing equipment.
4. The maintenance and regulation of fire escapes.
5. The means and adequacy of exit in case of fire, from factories, schools, hotels, lodging houses, asylums, hospitals, churches, halls, theatres, amphitheatres, and all other places in which numbers of persons work, live, or congregate, from time to time, for any purpose.
6. Investigation of the cause, origin and circumstances of fires.

In the light of these definitions there is no necessary conflict of duties between the two departments. Where such conflict arises it is usually caused by the appropriation of certain functions when a new building code or a new fire prevention code is being drafted, so that certain building department matters may creep into the fire prevention code and certain fire department matters into the building code. The following outlines of the scope of a building code and a fire prevention code have been prepared in the thought that they clearly indicate the sort of material that may be included in each of these two distinct codes.

It is not always possible or necessarily vital to have an exact line of demarkation between the functions of the building department and the fire department. If it is desired to take care of any possible conflict by legal enactment the plan adopted in the City of Los Angeles is a good one. In that city there is both a comprehensive building code and a fire prevention code. The matter of possible conflict between the building department and the fire prevention bureau, or between the two codes, is taken care of by the following section which appears in the fire prevention code.

"Nothing contained in this ordinance shall be deemed and/or construed to give any power and/or authority to the Board of Fire Commissioners, Fire Marshal and/or the Chief Engineer of the Fire Department, to enforce any provision and/or requirement of any ordinance and/or law which is under the jurisdiction of the Board of Building and

Safety Commissioners and/or which is required to be enforced by the Department of Building and Safety by the provisions of Sections 90 to 93 inclusive of Article 7 of the charter of the City of Los Angeles, and said Board, Fire Marshal and/or Chief Engineer and every representative and/or employee thereof shall not enforce and/or attempt to enforce any provision and/or requirement of any such ordinance and/or law, except when such ordinance and/or law specifically provides that some provision thereof is to be enforced by said Board, Fire Marshal and/or said Chief Engineer."

A similar section covering the relation of the building department to the fire prevention code is embodied and the code further provides that the building department of the city shall issue a certificate upon the completion of any building affected by the fire prevention ordinance, copy of which shall be forwarded to the Board of Fire Commissioners, and that the Fire Commissioners shall issue a permit for the occupancy of the building, provided it complies with the fire prevention code as well as the building code.

The City of Milwaukee presents a good example of efficient coöperation between the building department and the fire prevention bureau of the fire department. The Department of Buildings in Milwaukee assigns certain experienced men to make inspections of film exchanges, dry cleaning establishments, garages, gasoline filling service stations, storage of flammable liquids, and other buildings where manufacturing processes are found, storage and handling of hazardous materials, emphasizing, of course, the structural and maintenance angles of these properties. The fire prevention bureau of the fire department also makes inspections of this type of property. Any structural violations found by the inspectors of the fire prevention bureau are forwarded to the building department for their action. Two thousand five hundred and sixty-three reports of such violations were filed during one year. No conflict has ensued and there is thorough coöperation between the departments.

In the City of San Francisco a competent man from the bureau of fire prevention is provided desk space in the building department, and plans for garages and dry cleaning plants or for standpipes or sprinklers in buildings pass through his desk and must receive his approval before permits are issued by the building department. In this way the fire prevention interests of the property are assured.

In some cities administrators have taken the position that fire prevention inspection work can be handled by the building department of the city and that it is not necessary to have a bureau in the fire department to carry on this work. In our opinion this procedure does not work satisfactorily. It was carried on for some years in the City of Rochester, N. Y., and later abandoned in favor of the fire prevention bureau of the fire department. Such a plan is in existence in the City of St. Louis, where both the building and fire departments are under a Director of Public Safety, but the fire prevention inspection work has been handled by the building division. We have investigated the

work in St. Louis and are of the opinion that it does not accomplish as satisfactory results as if the fire prevention inspection work were transferred to the fire department. There is a noticeable lack of interest in the fire department in routine inspections for hazards because of their present lack of authority.

In 1933 the State Legislature of New York transferred the fire prevention work from the fire prevention bureau in the fire department to the building departments of the five boroughs. The fire department has retained its bureau of combustibles, but has no other fire prevention authority. A study of the New York situation made by the field engineers of the N.F.P.A. in June of this year indicates that confusion exists and that the general public is not receiving the proper service that it is entitled to under the present plan.

The fact should not be lost sight of that the fire department is the one most directly concerned with the question of safeguarding fire hazards because of the possible loss of life or injury to its own men. This concern is too vital a factor to be ignored. If the powers of fire prevention and fire hazard control are vested in other city departments than the fire department, the fire department very likely feels slighted and will inevitably lose a certain amount of interest in what should be a very important part of its work.

If building codes and fire prevention codes are properly drawn and proper definitions of the functions of the building department and the fire prevention bureau of the fire department are incorporated in such codes, and if the two departments coöperate with a mutual understanding of each other's problems, harmonious and efficient control of fire hazards may be secured in any city, and better construction and protection with consequent reduction of hazards to life and property will be secured.

Outline Showing Scope of a BUILDING CODE.

1. **Administration.** Organization of building department. Powers and duties of building official. Establishment of Board of Rules and Appeals, its powers and duties. Licenses, permits, fees, certificates of occupancy. Approval of materials and devices. Demolition of dangerous structures. Saving clause. Clauses covering repeal of other ordinances, date of adoption, validity and penalties.

2. **Definitions.**

3. **Classification of Buildings.** By occupancy, according to nature and amount of combustible materials, purpose of structure, number and distribution of occupants. By type of construction (i.e., relative fire resistiveness).

4. **General Building Restrictions.** Establishment of fire limits or fire zones. Height and area limits. Street encroachments. Restrictions as to type of construction. Restrictions as to use of buildings. (Such restrictions as the above should be consistent with zoning laws and ordinances as they affect location of certain trades and industries and the use of and occupancy of buildings, height and bulk of buildings and areas of courts, yards and other open spaces.)

5. **Light and Ventilation.**

6. **Exits.**

7. **Materials, Loads and Stresses** (Engineering Requirements).

8. **Construction.** Excavations, foundations, masonry, reinforced concrete, iron, steel and wood.

9. **Safeguards during Construction.**

10. **Requirements for Fire Resistance.** Fire resistance of materials. Protection of structural members. Definition of relative fire resistiveness of various types of construction. Fire walls and partitions. Firestopping. Protection of openings (fire doors, wired glass, fire shutters, open sprinklers). Enclosure of stairs and shafts. Roof structures and roof coverings.

11. **Chimneys and Flues.**

12. **Heating, Ventilating and Air Conditioning Systems.**

13. **Special Occupancy Provisions.** Special construction requirements of theatres, piers and wharves, dry cleaning plants, garages, buildings subject to dust explosion hazards (where not covered by a Fire Prevention Code).

14. **Elevators.**

15. **Plumbing.**

16. **Electrical Installations.**

17. **Gas Piping and Appliances.**

18. **Signs and Billboards.**

19. **Fire Extinguishing Equipment.** Standpipe and hose systems, automatic sprinklers, tanks, pumps, fire department connections, water supplies, fire alarm systems, fire extinguishers.

Outline Showing Scope of a
FIRE PREVENTION CODE.

1. **Administration.** Organization of fire prevention bureau. Powers and duties of fire chief or chief of bureau of fire prevention. Establishment of Board of Rules and Appeals, its powers and duties. (May be same board as that set up by Building Code.) Licenses, permits and fees. Approval of materials and devices. Saving clause, clauses covering repeal of other ordinances, date of adoption, validity, and penalties.

2. **Definitions.**

3. **Explosives and Ammunition.** Location and construction of magazines, handling and transportation.

4. **Flammable Liquids.** Classification of hazard of liquids, bulk storage, distances between above-ground tanks, and tanks and other buildings and property, handling in harbors and rivers, storage underground and in buildings, gasoline filling stations, oil storage in connection with oil burners, internal combustion engines, containers, tank trucks, gasoline vapor gas lamps, machines and systems, protective equipment.

5. **Lumber Yards.** Distances from other buildings and property, allowable dimensions of piles, spacing of piles, housekeeping, water supplies required.

6. **Dry Cleaning Establishments.** Installation and operation of equipment, protective equipment.

7. **Garages.** Ventilation, handling of gasoline, protective equipment.

8. **Paints, Varnishes and Lacquers.** Spray painting and spray booths, finishing processes, dip tanks, drying ovens, japanning and enameling, protection.

9. **Acetylene and Compressed Gases.** Acetylene, other compressed gases and liqué-

fied petroleum gases used in connection with lighting, heating, cooking, welding and cutting; storage of calcium carbide.

10. **Pyroxylin Plastics.** Locations where manufacturing plants are permitted, storage and sale, vaults for storerooms, displays, protective equipment.

11. **X-Ray and Photographic Nitrocellulose Film.** Storage, vented cabinets and vaults, protective equipment.

12. **Nitrocellulose Motion Picture Film.** Vented storage vaults, handling, purchase and distribution, scrap film, projection booths in motion picture theatres (if not covered by Building Code), protective equipment.

13. **Fireworks.** Limitation of types sold general public, licensing of persons to give public displays.

14. **Refrigeration Equipment.** Ammonia systems, carbon dioxide systems, sulphur dioxide systems, ethyl and methyl chloride systems and hydrocarbon systems, individual and multiple units.

15. **Fumigation Operations.** Notification of fire department and neighbors, safety measures.

16. **Matches.** Storage and handling in warehouses, grocery and other stores.

17. **Hazardous Chemicals.** List of materials for the storage of which a permit is required.

18. **Hazardous Occupancies.** Industries or industrial processes subject to dust explosions, storage of combustible fibres, hazards which exist or may arise and which are not specifically covered elsewhere in code, protective equipment, special construction requirements (where not covered by Building Code).

19. **Maintenance of Fire Equipment.** Requiring private hose, standpipes, sprinkler equipment, fire extinguishers and other fire equipment to be properly maintained, making tampering with fire equipment a misdemeanor. Provision making it possible for fire prevention bureau to order fire extinguishers or other protection additional to that called for by Building Code or Fire Prevention Code when hazard warrants.

20. **Maintenance of Exits.** Requires fire drills in certain occupancies. Prohibits use of space under stairways for storage, obstruction of aisles or exits in theatres or other places of assembly, obstruction of hallways, stairways or fire escapes, maintenance of lighting in exit stairways and hallways, operation of exit doors and general maintenance of safe conditions in buildings.

21. **General Maintenance.** Control of common fire hazards, flammable refuse, storage of boxes and barrels, bonfires and open lights, chimney cleaning, flammable decorations or scenery, metal cans for waste, rubbish or ashes stored inside buildings.

22. **Grass, Rubbish, Dumps.** Requiring the periodic cutting or burning over of grass plots, regulation of dumps and the storage of rubbish in vacant lots and around buildings.

23. **Co-operation with Fire Department.** Citizens' duties at fires, traffic regulations during response of fire apparatus, penalty for tampering with fire equipment or interfering with fire department at or on way to fires, maintenance of aisle spaces in warehouses, penalty for false alarms or for unauthorized possession of keys to fire alarm boxes.

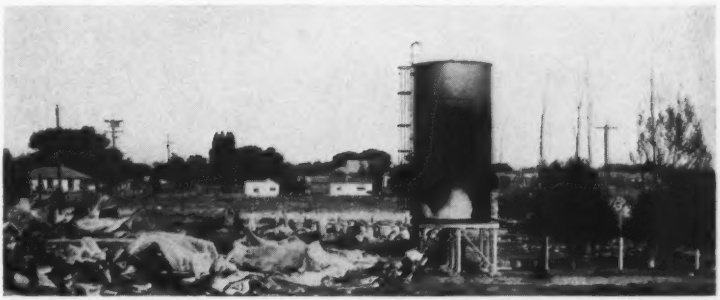
Colton, California, Gasoline Fire.

Fire destroying three small bulk gasoline and oil stations, and causing the death of one employee, in Colton, Calif., on July 11, 1935, like other fires in this class of property, was directly chargeable to features of construction and arrangement not in accordance with standard modern practice as outlined in the N.F.P.A. Suggested Ordinance for the Storage and Handling of Flammable Liquids. The tanks in the plant where the fire originated were of light corrugated iron construction with soldered joints. They were placed on wooden platform supports. Directly under one of the tanks was an electric motor operated pump and electric control switch of ordinary type, not suitable for use in hazardous locations.

Arrangement and Construction of Plants.

The block in which the plants were located runs beside a State highway at the west and has a dry wash in the rear. This dry wash was of considerable importance in taking care of burning gasoline which escaped during the fire. The northerly end of the block had an elevation of about five feet above the southerly end. Facing the street at the northerly end are situated a service station, restaurant and a combination garage and warehouse. Immediately south of these was the distributing plant in which the fire started. This

Ruins of the plant where the fire started, showing remains of corrugated iron gasoline storage tanks. A burned automobile was also in the wreckage.

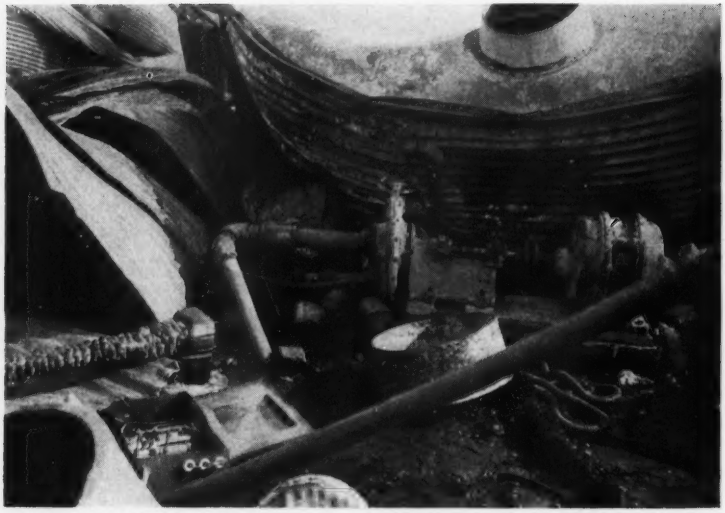


The upright welded steel tank, 70% full of gasoline, successfully withstood the fire although severely exposed by the substandard corrugated iron tanks, the ruins of which are shown at the left. The unprotected steel supports for this tank were kept cool by hose streams.

plant consisted of several substandard gasoline storage tanks of corrugated iron built on wooden platforms, together with some oil reclaiming apparatus, a garage and a considerable amount of oil in drums. The other two plants located at the south end of the block were of similar character.

Story of the Fire.

The fire occurred in the early morning of July 11, when a gasoline transport truck, located in the filling station yard, was discharging into one of the storage tanks of the adjoining distributing plant. The tank involved was made of corrugated iron and stood on a wooden platform, under which was a centrifugal motor driven pump and electrical control switch. It is believed that the tank overflowed and that the night attendant, who was in charge, operated the cut-off switch in order to stop the flow instead of closing the suction valve to the pump. Fire immediately followed, enveloping all three distributing plants in a few minutes. The attendant suffered burns from which he died three days later. The driver of the truck was able to disconnect his unloading hose and drive the truck from the yard. Substandard construction of the tanks and the use of wooden platforms for foundations made the control of this fire practically impossible. Failure of the wooden supports under the corrugated iron tanks and the opening of soldered seams in these tanks caused a rapid spread of the flames until all tanks except a welded steel tank and a small kerosene tank were involved. The welded steel tank was located at the extreme southwest corner of the block. The behavior of this tank was remarkable as it was on a steel platform and was exposed to considerable heat. Water streams were used in keeping the steel supports of this tank cool and there was no evidence of buckling visible after the fire. The tank was 70% full of gasoline.



Fire started when employee operated the non-vapor-proof electrical switch to stop the pump when this tank overflowed. The switch and pump were under the tank, which stood on a wooden platform. The employee was burned to death.

Burning gasoline from the tanks and lubricating oil from bursting drums were carried by water from the fire department hose streams into the adjoining dry wash and flowed for approximately one block south. There was no damage to surrounding property, as burning gasoline was confined to the wash. Across the street from the two southerly plants was a modern distributing plant of a large oil company which was protected from radiated heat by hose streams and was undamaged.

Extent of Damage.

Damage to the service station building was slight, but the three distributing plants were a total loss with the exceptions of one office building and the standard welded steel tank and the small kerosene tank. Two tank trucks and an automobile were also destroyed. Approximately 100,000 gallons of gasoline and oil were destroyed in the fire. The loss is estimated at $40,000.

Maison Blanche Building Fire.

By Louisiana Rating and Fire Prevention Bureau,
(Member N.F.P.A.).

The possibility of large losses occurring in fire-resistive office or mercantile buildings under good public fire protection and the importance of complete automatic sprinkler protection for combustible contents of such buildings is illustrated by the blaze which occurred in the thirteenth floor of the Maison Blanche Co. department store and office building in New Orleans, La., on June 18, 1935. The loss in this fire was in excess of $338,000, exclusive of losses due to interruption of business. A large proportion of the loss was from water damage.

The sprinklers in the attic storeroom where the fire started were under manual rather than automatic control and this deficiency, together with the rupture of the building standpipe, was responsible for the difficulty in controlling this fire and the large loss which resulted. Lack of floor waterproofing and drain facilities resulted in severe water damage on all floors, including damage to the stock of the department store on the lower floors.

Construction and Occupancy.

The building is of a familiar fire-resistive type, erected in 1906 and 1918 and having steel load bearing members, columns protected by hollow tile and plaster and beams and girders by reinforced cinder concrete poured integral with the concrete floor slab. Wood floor surfacing direct on concrete was used on all floors above the first except that the attic had a wood floor raised about two feet above the concrete floor.

The first five stories and basement were occupied by Maison Blanche Co. as a department store. The floors above were occupied by office tenants. The thirteenth and attic floor contained a broadcasting studio, stock rooms for the department store and for tenants, and a repair shop for the building management.

Fire protection in the building consisted of a three-supply wet pipe sprinkler system in the department store section and standpipes and hose throughout the building, normally dry, but supplied by a 1500 g.p.m. fire pump with manually controlled valves and three fire department connections. A sprinkler system covered the entire attic, fed from the dry standpipe system and therefore dependent on manual control for operation.

Story of the Fire.

A fire of unknown origin, preceded by a light explosion, occurred about 12:20 P.M. in the supply and record room of the Gulf Refining Co., one of the tenants, located in the attic section of the thirteenth floor and the south end of the east wing of the building. At the time of the fire there were two build-

Fire in the attic of the Maison Blanche Department Store Building, New Orleans, on June 18, 1935, caused a loss of $338,000. The building was of fire-resistive construction and the fire did not extend materially beyond the proportions shown in the picture. Lack of automatic water supply for sprinklers in the attic space, the failure of a standpipe, and non-waterproof floor construction were factors in the large loss.

ing employees and an employee of the tenants near by. Upon hearing the explosion the building engineer ran toward the fire with a chemical extinguisher, but so rapid was the spread of the fire among stationery stored on open wooden shelving that the extinguisher was useless. The fire department was immediately called by telephone and street box alarms, followed by a general alarm, bringing twenty-three pieces of apparatus in approximately five minutes. In the meantime the building engineer had gone to the basement to start the fire pump supplying the dry standpipe and sprinklers in the attic. Some twelve minutes elapsed before water reached the attic, by which time the fire had become so intense that when water did reach the system a three-inch line supplying twenty-four heads over the fire area had ruptured, due to rapid expansion by heat. Shortly afterward 124 additional heads opened, but due to low pressure caused by the broken line were of little value.

The fire department, upon arrival, connected six 900 g.p.m. pumpers to the standpipe system at the street connections. Firemen using two standpipes in the attic and one on the floor below obtained six hose streams. Four of these streams were used in the attic and two were directed from the roof through a skylight almost directly over the fire. These streams, although of low pressure and inadequate volume, due to loss of water through the sprinkler system, practically controlled the fire at about 2 P.M.

About this time, firemen in an effort to increase pressure on hose lines decided to shut off sprinklers. After considerable delay in locating the control valve the sprinklers were shut off about 2:30 P.M. This resulted in a heavy increase of pressure in the standpipe systems, as fire department pumpers had been operating at 300 pounds pressure. This pressure increase resulted in a rupture of the bell and spigot pipe supplying the standpipes located beneath the floor of the store. With the supply to hose lines thus cut off, the fire immediately rekindled. The fire department was obliged to run lines direct from pumpers. Two lines were taken up an elevator shaft and stairway to the thirteenth floor and one was run up the front of the building over the roof and played through the skylight. Water was again available about 3 P.M. and the fire was extinguished about 5 P.M.

Water Damage and Loss.

During the course of four and a half hours the use of hose streams and water from the sprinkler system resulted in tons of water being discharged. Water flowed down the "H" columns of the building, entering at a column where tile had broken away. Some water was diverted at each floor where web plates of beams join the column. Other channels for the flow of water were furnished by pipe shafts, stairs and elevator openings. The porous nature of the concrete of floors and around beams and columns furnished little impediment to the flow of water. Water penetrated every floor from attic to basement, with severe damage on all floors, including stock of the department store.

The loss to the building was $164,678.23; to contents of the Maison Blanche department store was $148,908.76; and damage to other tenants was approximately $25,000; making a total of $338,586.99 exclusive of business interruption losses.

For many years the hazards of storing large quantities of combustible materials in this inaccessible attic had been severely criticized by insurance engineers. All efforts to have an automatic sprinkler system installed were fruitless and the sprinkler system supplied by the dry standpipe was installed as a compromise. Had automatic protection been provided the loss would probably have been nominal.

View showing early stages of the San Francisco, Calif., conflagration of April 18, 1906. This conflagration, the largest loss conflagration in history, destroyed 28,000 buildings and caused $350,000,000 property damage. The fire followed an earthquake which broke water mains and handicapped fire fighting operations. As shown by this picture, the destruction was primarily due to the fire rather than the earthquake.

100 Conflagrations Since 1900.

The danger of a wide-spreading fire, commonly termed a conflagration, exists in practically every city or town in the United States and in Canada. The following record of the principal conflagrations occurring in the United States and Canada since 1900, together with a summary of some of the larger conflagrations occurring before 1900, serves to call attention to the importance of the conflagration as perhaps the most serious element in the national fire waste. A single conflagration can exceed in fire loss the total annual loss for a year and can have most disastrous consequences not only to the particular city where the conflagration occurs, but over a wide area or even nationally.

The conditions which have made possible past conflagrations exist today to a large extent. Although modern protective equipment and improved construction are gradually reducing the likelihood of a conflagration, a combination of unfavorable circumstances, such as drought conditions, interruption of water supplies, or a series of simultaneous fires can result in a conflagration.

The infrequency of conflagrations in any one locality tends to give fire protection officials as well as the public a false sense of security. The tragic consequences to a community once a conflagration starts make it imperative that, in every community, attention be given to elimination of conditions which may breed a conflagration.

There is no universally accepted definition of a conflagration. Some authorities have listed as conflagrations all fires causing more than a specified amount of loss, irrespective of the area burned over or the number of buildings destroyed, but the term conflagration is generally applied only to fires extending over a considerable area and destroying numbers of buildings. There is no clear-cut line of demarkation between a conflagration and the individual large loss fire or group fire. For the purposes of this record conflagrations have been considered as including only those fires spreading over a wide area and destroying numbers of buildings under a diversity of ownership. A fire in a group of buildings all belonging to a single industrial plant, for example, is not considered a conflagration, even though the area and values involved may be considerable. If all group fires and fires involving large losses in a single building were to be included, this record would cover several times the number of fires included. The article is, however, limited to the special type of fire commonly regarded as a conflagration and excludes large loss individual fires even though they may cause just as great a damage and involve as serious a problem in fire fighting as do some of the smaller city conflagrations. Likewise, forest fires have not been included in this record except in instances where they spread to and destroyed built-up communities, because they present a somewhat different problem which is outside the scope of this article.

flagration in history, destroyed 28,000 buildings and caused $350,000,000 property damage. The fire followed an earthquake which broke water mains and handicapped fire fighting operations. As shown by this picture, the destruction was primarily due to the fire rather than the earthquake.

Ruins of the Baltimore, Md., conflagration of February 7, 1904, which destroyed eighty city blocks in the business district with a loss of $50,000,000. Twenty-seven fire-resistive buildings were gutted in this fire due to fire entering unprotected window openings and igniting combustible contents. The fire started in an unsprinklered "conflagration breeder" and was soon beyond control. Non-standard hose couplings interfered with effective assistance by fire apparatus from other cities.

Wooden shingle roofs functioning as fire spreaders in the Atlanta, Ga., conflagration of May 21, 1917, in which 1938 buildings were destroyed with a loss of $5,500,000. The conflagration started in a small frame shanty at a time when the fire department was fighting three serious fires. Before apparatus could respond, seven separate fires were burning due to wooden shingles.

Some of the numerous large loss fires which have occurred in the United States and Canada since 1900 are recorded in Table III, which includes cases where fires reported to the N.F.P.A. Department of Fire Record involved an individual loss of $3,000,000 or more. This serves to show the character of such fires which for the purposes of this record have not been regarded as conflagrations.

The table on page 139 lists one hundred conflagrations occurring in the United States and Canada since Jan. 1, 1900. These have been selected as the outstanding conflagrations during this period, considered on the basis of character and extent, rather than amount of loss, as explained previously. Many of these fires occurring in small communities, while not given national prominence, are nevertheless major catastrophes to the particular community concerned. Numerous group fires, often referred to as conflagrations, have not been included in the record.

The factors listed as responsible for the conflagrations in this record are those contributing to the spread of fire beyond the building or immediate area of origin in so far as could be determined from the data available. In other words, a conflagration has not been considered as such until it was

T. E. Penard.

Fire originating in the rag shop district of Chelsea, Mass., on April 12, 1908, destroyed 3500 buildings with a loss of $12,000,000. Wooden shingle roofs were the principal factor in the spread of the fire.

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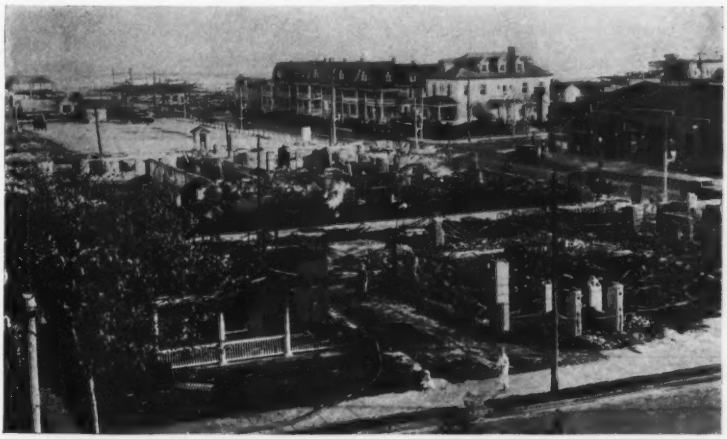
Fire originating in the rag shop district of Chelsea, Mass., on April 12, 1908, destroyed 3500 buildings with a loss of $12,000,000. Wooden shingle roofs were the principal factor in the spread of the fire.

Ruins of buildings in the business district of Atlanta, Ga., destroyed by the fire of May 8, 1908. Due to delayed alarm, low water pressure and lack of exposure protection, fire spread from the bakery where it originated and destroyed thirty buildings of brick construction with a loss of $1,250,000.

The Montgomery, Ala., conflagration of June 4, 1927, as it was being brought into control. Fire started in a junk yard in the left foreground. Due to a delayed alarm and bursting of fire hose, the fire was soon out of control and destroyed twenty-two buildings in the business district with a loss of $1,500,000. The fire was stopped when it reached sprinklered buildings in the background.

View taken from the approximate point of origin of the Ocean City, N. J., conflagration of October 11, 1927, which started in a theatre on the boardwalk and destroyed buildings covering an area of four city blocks, causing a loss in excess of $810,000.



The ruins of nine buildings more than a block distant from the main conflagration. These buildings were destroyed due to ignition of wooden shingle roofs by sparks carried over the row of houses in the middle background.

The Montgomery, Ala., conflagration of June 4, 1927, as it was being brought into control. Fire started in a junk yard in the left foreground. Due to a delayed alarm and bursting of fire hose, the fire was soon out of control and destroyed twenty-two buildings in the business district with a loss of $1,500,000. The fire was stopped when it reached sprinklered buildings in the background.

spreading through a group of buildings beyond control. For this reason, the cause of the fire in the building of origin and its extension from the incipient stage to involve the entire building, have been omitted from this record. While these, of course, are the primary causative factors in any conflagration,

International.

Panoramic view of part of the ruins of the Coney Island, New York City, conflagration of July 13, 1932, which resulted in a loss of $2,000,000. The fire started from a bonfire under the Boardwalk at the left of the picture and was swept northward (to the right) by wind from the ocean. As may be seen from the picture, brick joisted buildings, including two large apartment houses, made up a large part of the fire area. Delayed alarm, combustible construction and lack of exposure protection contributed to the extent of the fire. This picture was taken from the roof of a fire-resistive building that stopped the spread of the fire to the east.

Wooden shingle roofs caused the destruction of Paris, Texas, on March 21, 1916, with a $11,000,000 loss. The fire started in a frame warehouse when a high wind was blowing. Wooden shingle roofs ignited blocks ahead of the main fire. A total of 1440 buildings, including both business and residential structures, were destroyed.

they are no different in the conflagration than in the large loss individual building fire and it is not within the scope of this article to consider them. Large area buildings of combustible construction, often with highly combustible contents, and without automatic sprinkler protection, have been primarily responsible for a large number of conflagrations. The removal of such structures or their complete protection by automatic sprinklers might to a notable extent eliminate the danger of city conflagrations.

The Baltimore Conflagration in 1904 is reported as due to a carelessly discarded cigarette thrown through a sidewalk grating. The fire soon involved the basement of the building, igniting a stock of combustible materials near the bottom of unprotected vertical openings, and spread to involve the entire structure in a very short space of time. The conflagration might thus be said to be due initially to careless smoking. It might also be charged to combustible construction, to unprotected vertical openings and combustible contents. Going one step further it could very properly be charged to lack of automatic sprinkler protection in this building. However, for the purposes of this record the fire has been considered as a conflagration only as it spread beyond the building of origin, this spread being primarily due to lack of protection of surrounding buildings against exposure. It should, however, be kept in mind that every conflagration is localized at its start and that the best method of conflagration control is to stop the conflagration at its source, by the accepted methods of fire prevention and protection. Municipal authorities realize, however, that no matter how much care is taken in the safeguarding of the individual buildings where conflagrations might originate there is always the possibility that an individual building fire may get beyond control and it is only through measures designed to cope with fires spreading beyond the building of their origin that reasonable safety against city conflagrations can be secured.

the fire. This picture was taken from the roof of a fireresistive building that stopped the spread of the fire to the east.

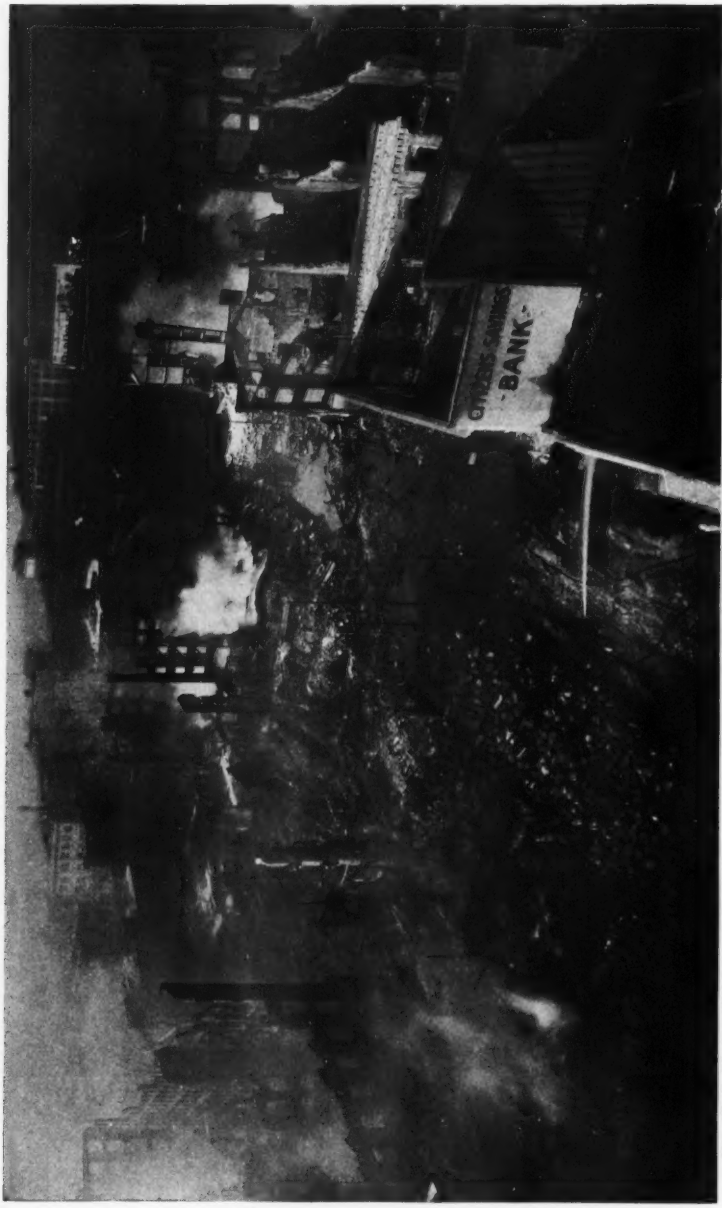
This picture, taken during the beach resort conflagration at Hull, Mass., on the night of March 27, 1923, illustrates ignition by radiated heat with no direct contact of flame. This fire destroyed 44 buildings with a loss of $250,000.

Table I.

One Hundred Conflagrations Since 1900 in the United States and Canada.

Date	Location	Property Destroyed	Factors Responsible (Key Numbers, Table IV)	Reported Loss
June 30, 1900	Hoboken, N. J.	Piers and steamships (326 killed, many missing)	13	$4,600,000
May 3, 1901	Jacksonville, Fla.	1700 buildings	1, 3, 5, 8	11,000,000
Feb. 5, 1902	Waterbury, Conn.	20 blocks in business district	3, 5	2,000,000
Feb. 8, 1902	Paterson, N. J.	525 buildings	1, 3, 5, 16	5,500,000
Feb. 7, 1904	Baltimore, Md.	80 city blocks in business section	5, 15	50,000,000
Feb. 26, 1904	Rochester, N. Y.	Business district	5, 8	2,315,750
April 4, 1904	West Tampa, Fla.	100 buildings	1, 2, 3, 4	200,000
April 19, 1904	Toronto, Ont.	123 business buildings	2, 3, 4, 5, 9	12,000,000
May 25, 1904	Yazoo City, Miss.	200 buildings (1 killed)	1, 2	1,000,000
Dec. 23, 1904	Sioux City, Iowa.	2½ blocks business section (1 killed)	4, 5	1,860,000
Feb. 25, 1905	Hot Springs, Ark.	200 buildings (5 killed)	1, 2, 4	1,500,000
April 14, 1905	Springvale, Me.	47 buildings	2, 4, 18	300,000
Sept. 24, 1905	Butte, Mont.	Business and residential sections	1, 2, 5	850,000
April 18, 1906	San Francisco, Cal.	28,000 buildings	11, 19	350,000,000
July 28, 1907	New York, N. Y.	Coney Island buildings covering 27 acres	6	1,500,000
Nov. 8, 1907	Superior, Wis.	One mile of waterfront property	1, 13	2,500,000
March 1, 1908	Tampa, Fla.	17 blocks of buildings	1, 2	450,000
April 12, 1908	Chelsea, Mass.	3500 buildings (1 killed)	1, 3, 10, 12, 17	12,000,000
May 8, 1908	Atlanta, Ga.	30 business buildings	5, 8, 11	1,250,000
Aug. 30, 1908	New Orleans, La.	22 business buildings destroyed, 29 damaged	2, 5, 9, 21	1,000,000
Sept. 21, 1908	Chelsea, Mass.	33 buildings destroyed	6, 9, 17	1,300,000
Sept. 4, 1908	Chisholm, Minn.	Forest fires destroyed town	1, 4, 10, 14	1,393,156
April 3, 1909	Fort Worth, Texas.	255 buildings (1 killed)	1, 3	610,340
April 3, 1909	Dallas, Texas	65 buildings	1, 3, 12	215,000
April 13, 1909	Rochester, N. Y.	50 buildings	1, 8, 12	500,000
Aug. 11, 1909	Monticello, N. Y.	36 buildings	1, 3, 4	500,000
Oct. 19, 1909	Milton, N. H. and Lebanon, Me.	23 buildings	1	250,000
Dec. 12, 1909	Racine, Wis.	23 buildings destroyed or damaged	1, 4	500,000
March 24, 1911	Fayette, Ala.	42 buildings	4,	500,000
April 30, 1911	Bangor, Me.	267 buildings (2 killed)	1, 5	3,188,081
May 27, 1911	New York, N. Y.	Coney Island amusement resort, 200 buildings	6, 8, 11	1,500,000
June 12, 1911	Whiteright, Texas.	70 buildings	4	300,000
July 1, 1911	West Salem, Wis.	32 buildings and lumber yard	4	250,000
Nov. 28, 1911	Jamestown, Kans.	30 buildings	1, 4, 5	250,000
Feb. 21, 1912	Houston, Texas.	140 buildings	1, 2, 3, 7	2,500,000
April 25, 1912	Columbus, Ga.	40 dwellings	1, 2	132,850
Sept. 3, 1912	Santa Monica and Venice, Calif.	Amusement resort, stores, hotels, etc.	2, 3, 4	2,760,000
Feb. 2, 1913	Savannah, Ga.	Five blocks of waterfront property	5, 8, 11	630,000
Aug. 20, 1913	Jersey City, N. J.	40 buildings	2, 5, 7, 9, 20	540,000

This picture, taken during the beach resort conflagration at Hull, Mass., on the night of March 27, 1923, illustrates ignition by radiated heat with no direct contact of flame. This fire destroyed 44 buildings with a loss of $250,000.



The Fall River, Mass., conflagration of February 2, 1928, started in a large five-story mill being dismantled, the ruins of which are shown at the extreme left of this picture. Sprinkler protection had been removed from this building and, due to high wind and great headway of the fire when the department arrived, flames spread into the adjacent business section, causing a loss of $2,514,000.

Table I — Continued.

Date	Location	Property Destroyed	Factors Responsible (Key Numbers, Table IV)	Reported Loss
Sept. 5, 1913	Hot Springs, Ark.	518 buildings	1, 2, 3, 4, 9	2,250,000
April 2, 1914	St. Augustine, Fla.	34 buildings	1, 2,5	500,000
June 25, 1914	Salem, Mass.	1600 buildings (6 killed)	1, 2, 3, 4, 10, 11, 15	14,000,000
Sept. 23, 1915	Hampton Beach, N. H.	40 buildings destroyed	1, 2, 4	200,000
Nov. 29, 1915	Avalon, Calif.	Several hotels and business blocks	4	1,000,000
Feb. 15, 1916	Fall River, Mass.	25 business buildings	5	900,000
March 21, 1916	Paris, Texas.	1440 buildings	1, 3, 5	11,000,000
March 22, 1916	Nashville, Tenn.	648 buildings (1 killed)	1, 3	1,500,000
March 22, 1916	Augusta, Ga.	682 buildings	1, 3, 4, 5, 17	4,250,000
May 21, 1917	Atlanta, Ga.	1938 buildings	1, 12	5,500,000
April 4, 1918	Kansas City, Mo.	21 industrial and warehouse buildings	2, 3, 5	2,000,000
April 8, 1918	West Tampa, Fla.	9 city blocks	1	200,000
June 25, 1918	Cle Elum, Wash.	17 blocks destroyed	1, 3	550,000
Aug. 13, 1918	Marianna, Ark.	15 business buildings	2	750,000
Oct. 12, 1918	Minnesota.	Forest fires covering 15 townships (559 killed)	1, 3, 10, 14	25,000,000
Feb. 14, 1919	Savannah, Ga.	11 factory and warehouse buildings	2, 3, 4, 6	1,000,000
May 21, 1919	Mobile, Ala.	192 buildings	1, 3, 15	200,000
Aug. 27, 1919	Los Banos, Calif.	48 buildings	2	500,000
March 14, 1920	Grandview, Tex.	136 buildings	1, 2, 3	2,000,000
Jan. 25, 1921	Athens, Ga.	14 buildings	2, 4, 5	800,000
June 26, 1921	Hampton Beach, N. H.	50 buildings	1, 2, 4	500,000
Aug. 2, 1921	Richibucto, N. B.	40 buildings	No data	320,000
Dec. 4, 1921	Yuma, Ariz.	25 business buildings (1 killed)	No data	1,000,000
March 15, 1922	Chicago, Ill.	13 business buildings	5, 7, 12	5,500,000
April 13, 1922	Norfolk (Berkley), Va.	100 buildings, 3 steamboats and lumber mill	1, 2	750,000
June 15, 1922	New York, N. Y.	141 buildings (Arverne section)	1, 2	2,000,000
Oct. 4, 1922	Northern Ontario	Forest conflagration covering eighteen townships (44 killed)	1, 3, 10, 14	6,369,000
Dec. 1, 1922	New Bern, N. C.	1000 buildings	1, 3, 12	1,500,000
Dec. 1, 1922	Terrebonne, P. Q.	75 buildings	2, 3	500,000
Dec. 8, 1922	Astoria, Ore.	30 city blocks in business section	4, 13	10,000,000
March 28, 1923	Hull, Mass.	44 buildings	1, 3, 16	250,000
May 26, 1923	St. Agatha, P. Q.	150 buildings	No data	400,000
June 2, 1923	Canaan, N. H.	44 buildings destroyed (2 killed)	1	150,000
July 13, 1923	Mace and Burke, Idaho.	2 mining towns in Burke Canyon destroyed	1, 4	750,000
Sept. 17, 1923	Berkeley, Calif.	640 buildings	1, 2, 3, 14	6,000,000
Nov. 14, 1924	Jersey City, N. J.	2 blocks of factories and tenements	3, 5, 6	1,000,000
June 11, 1925	Nahant, Mass.	50 buildings	1, 2	300,000
Sept. 4, 1925	Shreveport, La.	196 buildings	1, 11	1,000,000
March 1, 1926	Newport, Ark.	280 buildings (1 killed)	1, 2, 4	1,500,000
June 4, 1927	Montgomery, Ala.	22 buildings	5, 7, 9	1,500,000
Oct. 11, 1927	Ocean City, N. J.	30 buildings	1, 3	810,926
Feb. 2, 1928	Fall River, Mass.	38 buildings destroyed, 69 damaged (1 killed)	3, 5, 6, 16	2,514,000

The Fall River, Mass., conflagration of February 2, 1928, started in a large five-story mill being dismantled, the ruins of which are shown at the extreme left of this picture. Sprinkler protection had been removed from this building and, due to high wind and great headway of the fire when the department arrived, flames spread into the adjacent business section, causing a loss of $2,514,000.

Looking across the fire-swept area of Norfolk, Va., toward the waterfront, where fire, starting in a frame wharf on June 7, 1931, destroyed or damaged sixty buildings with a loss of $1,250,000.

Table I — Continued.

Date	Location	Property Destroyed	Factors Responsible (Key Numbers, Table IV)	Reported Loss
March 29, 1928	Crisfield, Md.	90 buildings	7, 11	700,000
April 20, 1928	Richwood, W. Va.	45 buildings	2, 4	400,000
July 2, 1929	Mill Valley, Calif.	130 buildings	1, 2, 14	1,500,000
July 21, 1929	Wainwright, Alta.	67 buildings	No data	1,000,000
May 4, 1930	Nashua, N. H.	350 buildings	1, 2, 10	2,000,000
June 7, 1931	Norfolk, Va.	60 buildings	5, 6, 7	1,250,000
June 22, 1931	St. John, N. B.	Waterfront conflagration	9, 13	5,000,000
June 27, 1931	Spencer, Iowa.	24 business buildings	2, 5	800,000
March 1, 1932	Pennsgrove, N. J.	36 buildings destroyed, 23 damaged	1, 2, 3	400,000
July 13, 1932	New York, N. Y.	5 city blocks (Coney Island section)	8, 13	2,000,000
Sept. 8, 1932	Highland Boy, Utah.	63 buildings in Bingham Canyon destroyed	4, 5, 6	350,000
May 7, 1933	Ellsworth, Me.	127 buildings	1, 2	1,300,000
May 15, 1933	Auburn, Me.	250 buildings	1, 3, 12	1,500,000
June 25, 1933	Lowell, Mass.	10 buildings destroyed, 35 damaged	1, 6, 7	250,000
Aug. 7, 1933	Cornwall, Ont.	31 business buildings	1, 3, 6	241,670
Jan. 28, 1934	Wrightsville Beach, N. C.	103 buildings	1, 2, 4	550,000
May 19, 1934	Newburyport, Mass.	29 buildings destroyed, 9 damaged	1, 5, 7	400,000
May 19, 1934	Chicago, Ill.	Stockyard area and business buildings (1 killed)	6, 10	4,617,000
Sept. 17, 1934	Nome, Alaska.	20 city blocks	2, 4	2,000,000

Looking across the fire-swept area of Norfolk, Va., toward the waterfront, where fire, starting in a frame wharf on June 7, 1931, destroyed or damaged sixty buildings with a loss of $1,250,000.

The start of the Newburyport, Mass., fire of May 19, 1934, which destroyed or seriously damaged thirty-eight buildings besides causing numerous fires on wooden shingle roofs over an area half a mile long. This picture, taken fifteen minutes after the first alarm, shows the headway of the fire in the idle wooden factory, where it originated. Sprinklers had been shut off to prevent freezing.

The Auburn, Me., conflagration of May 15, 1933, which destroyed 250 buildings with a loss of $1,500,000. Fire started in the triangular block at the top center of the picture while firemen were engaged at other fires. The spread was largely due to wooden shingle roofs.

The Auburn, Me., conflagration of May 15, 1933, which destroyed 250 buildings with a loss of $1,500,000. Fire started in the triangular block at the top center of the picture while firemen were engaged at other fires. The spread was largely due to wooden shingle roofs.

Fire starting in a stock of fireworks in a drug store destroyed twenty-four buildings in the business section of Spencer, Iowa, with a loss of $800,000, on June 27, 1931. Lack of exposure protection and an inadequate water supply were responsible for the extent of the fire.

Conflagrations prior to 1900 have not been analyzed in this record, as conditions have so changed that the circumstances of such fires are of limited significance in respect to the study of present conflagration possibilities. The following table records a few of the largest loss conflagrations in the earlier period.

Table II.

Conflagrations in the United States Occurring Prior to 1900 Involving Losses in Excess of $3,000,000.

Date	Location	Property Destroyed	Loss
1835	New York, N. Y.	Buildings covering thirteen acres	$15,000,000
1845	Pittsburgh, Pa.	1000 buildings	3,500,000
1849	St. Louis, Mo.	425 buildings, 27 steamships (1 killed)	3,500,000
1851	San Francisco, Cal.	2500 buildings	3,500,000
1861	Charleston, S. C.		10,000,000
1866	Portland, Me.	1500 buildings	10,000,000
1871	Chicago, Ill.	17,430 buildings	168,000,000
1872	Boston, Mass.	776 buildings (13 killed)	75,000,000
1874	Chicago, Ill.		5,000,000
1889	Seattle, Wash.		5,000,000
1889	Spokane, Wash.		6,000,000
1889	Boston, Mass.	52 buildings (4 killed)	3,600,000
1889	Lynn, Mass.		5,000,000
1892	Milwaukee, Wis.		6,000,000

The Chicago, Ill., local conflagration of March 15, 1922, originated in a two-story, unsprinklered brick factory and assumed great headway before it was discovered. Thirteen buildings, several of which had substandard automatic sprinklers, were destroyed with a loss of $5,000,000, exclusive of records. The fire-resistive Burlington Building at the right was severely damaged when fire crossed Clinton Street, 80 ft. wide, and entered through unprotected windows on the eight upper floors.

F. C. Scott.

Start of the Ellsworth, Me., conflagration of May 7, 1933, which destroyed 127 buildings with a loss of $1,300,000. The fire in this old wooden storehouse, long recognized as a fire menace, was set by a pyromaniac. Note the furious burning of the wooden roof, from which flying brands spread to other wooden shingle roofs, resulting in a conflagration.

D. M. Maher.

A block of dwellings burning at the height of the conflagration, showing the character of construction and extreme rapidity of burning. Inadequate water supply and high wind handicapped firemen. Most of the buildings destroyed had wooden shingle roofs.

The Chicago, Ill., local conflagration of March 18, 1922, originated in a two-story, unsprinklered brick factory and assumed great headway before it was discovered. Thirteen buildings, several of which had substandard automatic sprinklers, were destroyed with a loss of $5,000,000, exclusive of records. The fire-resistive Burlington Building at the right was severely damaged when fire crossed Clinton Street, 80 ft. wide, and entered through unprotected windows on the eight upper floors.

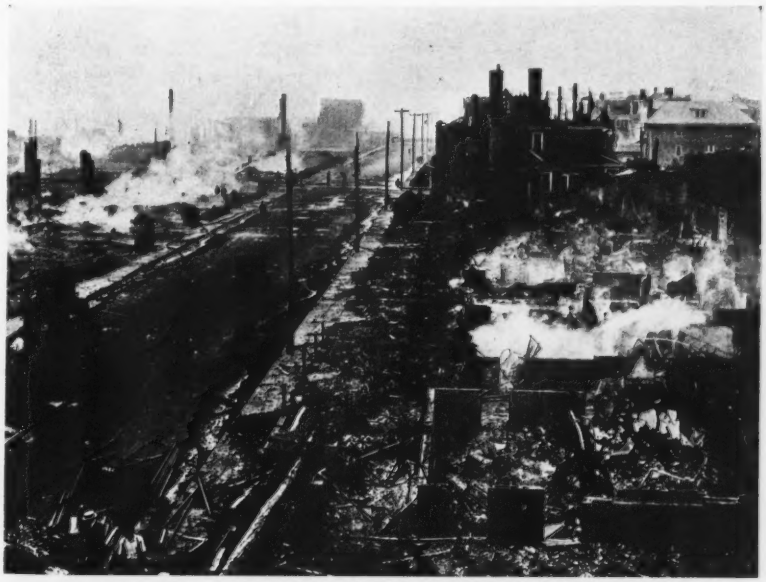
International.

Starting from a seemingly insignificant blaze on a railroad bridge, a conflagration swept through a manufacturing and residential section of Nashua, N. H., on May 4, 1930, destroying 350 buildings and causing a loss of $2,000,000. The fire, covering an area more than a mile long, was spread chiefly by flying brands falling on wooden shingle roofs. Several buildings with fire-resistive roofs in the path of the conflagration were not damaged.

Table III.

Typical Fires Since 1900 with Losses Reported at $3,000,000 or More. Not Classified as Conflagrations.

Date	Location	Description	Estimated Loss
1906	New Orleans, La.	Stuyvesant docks	$3,500,000
1911	Albany, N. Y.	State capitol	5,500,000
1912	New York, N. Y.	Equitable Building	3,500,000
1916	Jersey City, N. J.	Black Tom Disaster, R. R. terminal	22,000,000
1917	Kingsland, N. J.	Munitions plant	12,000,000
1918	St. Louis, Mo.	Government warehouse	3,000,000
1918	Morgan Station, N. J.	Munitions plant	5,000,000
1919	Cedar Rapids, Iowa.	Starch factory	3,000,000
1921	Warner, N. J.	Oil refinery	3,000,000
1922	New Orleans, La.	Wharves, U. S. Army Supply Base	4,500,000
1925	Beaumont, Texas.	Ships	3,500,000
1925	New Orleans, La.	Wharves and warehouses	4,000,000
1926	San Louis Obispo, Calif.	Oil reservoirs	8,265,000
1926	Brea, Calif.	Oil reservoirs	3,600,000
1926	Lake Denmark, N. J.	Arsenal explosion	75,000,000
1929	Hollywood, Calif.	Film laboratory	3,145,000
1931	Buffalo, N. Y.	Armory	5,032,000
1933	Tillamook Co., Ore.	Forest fire	10,000,000



Fire originating on the wooden shingle roof of a frame hotel destroyed one hundred and forty-one buildings in the Arverne section of New York City on June 15, 1932, with a loss of $2,000,000. Flying brands spread the fire to wooden shingle roofs of frame dwellings and boarding houses. Inadequate water supplies and an insufficient number of hydrants handicapped firemen.

Starting from a seemingly insignificant blaze on a railroad bridge, a conflagration swept through a manufacturing and residential section of Nashua, N. H., on May 4, 1930, destroying 350 buildings and causing a loss of $2,000,000. The fire, covering an area more than a mile long, was spread chiefly by flying brands falling on wooden shingle roofs. Several buildings with fire-resistive roofs in the path of the conflagration were not damaged.

A mute reminder of those days following June 25, 1914, when Salem, Mass., swept by a wooden shingle roof conflagration, was thrown upon the charity of the rest of the country. Fire started in a frame factory handling highly flammable material in the midst of a residential district. Wooden shingle roofs spread the fire to destroy 1600 buildings with a loss of $14,000,000. The ruins of the Naumkeag Mills, the largest cotton mill in the world at the time, may be seen in the background.

These two fire-resistive buildings were gutted during the Augusta, Ga., conflagration of March 22, 1916, when fire entered ordinary glass windows. The fire, starting in a five-story mercantile building of inferior construction, destroyed 680 buildings with a loss of $4,250,000. Twenty thousand bales of cotton were destroyed in this fire. This cotton, stored in the streets in the business district in violation of city ordinances, obstructed the path of fire apparatus, interfered with access to hydrants, and furnished fuel for the very rapid spread of fire. Wooden shingle roofs and a high wind were largely responsible for its spread through the residential district. Fire apparatus from Waynesboro, Macon and Atlanta, arriving while the fire was at its height, was powerless to assist the harassed Augusta firemen, because the hose couplings would not fit.

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The conflagration which destroyed 640 buildings in Berkeley, California, on Sept. 17, 1923, started in a brush fire which a high wind swept toward the city over a wide front. Wooden shingle roofs were ignited over a large area and the fire department was under a serious handicap because of inadequate sized water mains. The loss was $6,000,000.

Factors Responsible for Conflagrations.

The factors listed below are derived from a study of reports of the one hundred conflagrations since 1900 in the list on page 139. Conflagrations are seldom due solely to any one factor and the summary below indicates the number of fires to which each factor has contributed rather than one outstanding factor for each fire. No attempt has been made to list all the minor factors responsible for the spread of these fires, but the principal ones have been determined as accurately as possible from the reports in the N.F.P.A. fire record files. In four instances the data were not sufficiently complete to assign factors, and in several other instances it seems probable that additional factors were involved not appearing in the reports.

Inferior and combustible construction is a serious factor in the development of conflagrations and is a particularly vital matter where large areas of closely built frame construction exist in congested sections. Combustible construction and contents of buildings have obviously contributed to every conflagration and, for this reason, have not been specifically listed except where the factors of congestion and inaccessibility have been involved.

Table IV.

Principal Factors Contributing to 100 Conflagrations in the United States and Canada Since 1900.

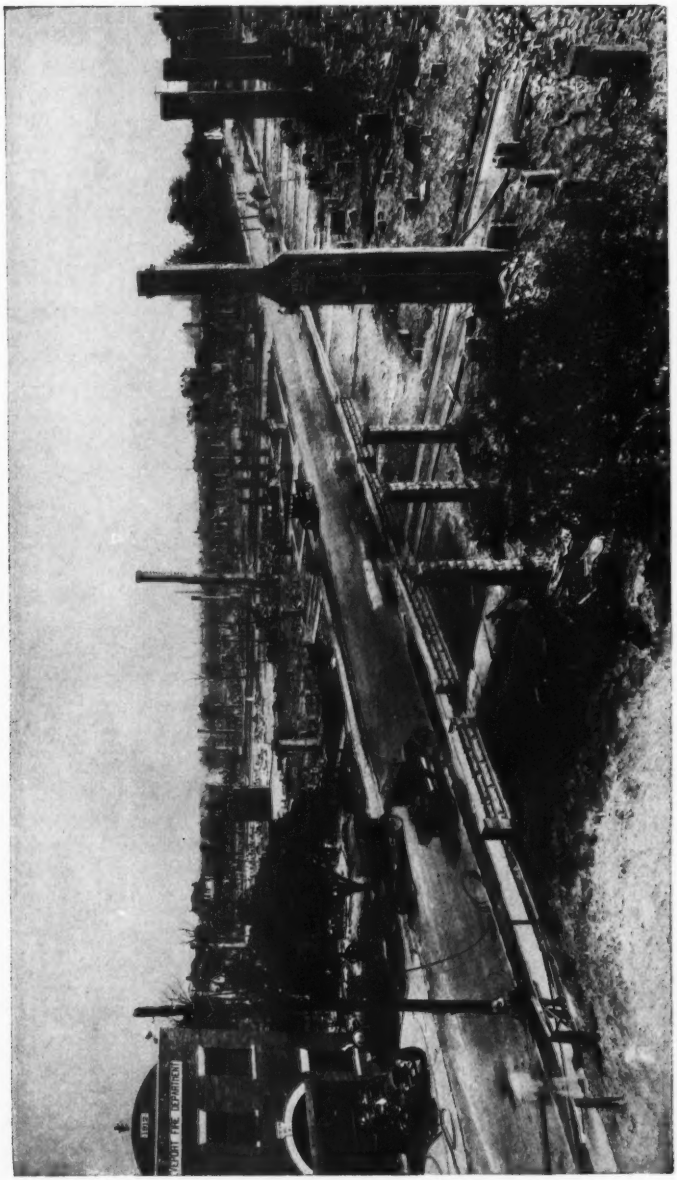
(Not including combustible construction or contents which contribute to every fire.)

Key Number	Factor	No. Times Contributing
1	Wooden shingle roofs	55
2	Inadequate water distribution system	37
3	Wind velocity in excess of 30 m.p.h. or "high"	33
4	Inadequate public protection	28
5	Lack of exposure protection	28
6	Congestion of hazardous occupancies difficult of access for fire fighting	11
7	Delay in discovery of fire	8
8	Delay in giving alarm	7
9	Ineffective fire fighting	7
10	Unusually hot or dry weather conditions	7
11	Failure of water pumps or breakage of pipes	7
12	Fire department at other fires	7
13	Fire spread through inaccessible open spaces under piers or buildings	5
14	Forest or brush fire entered town	5
15	Hose couplings or hydrant connections not standard	3
16	Winter conditions severe	3
17	Cotton rags, etc., stored outside buildings	2
18	Failure of private fire protection	1
19	Earthquake preceding fire	1
20	Slow response of fire department	1
21	Fire alarm failed	1
	Insufficient data as to factors responsible	4

Characteristics of Conflagrations.

Conflagrations have been of three general types. These are fires starting in hazardous occupancies or fire breeders in congested sections and which spread over a constantly widening front before adequate resistance can be

wind swept toward the city over a wide front. Wooden shingle roofs were ignited over a large area and the fire department was under a serious handicap because of inadequate sized water mains. The loss was $6,000,000.



The Shreveport, La., conflagration of September 4, 1925, started in a house across the street from the fire department station shown in the picture, and destroyed 196 dwellings with a loss of $1,000,000. The water system was out of service due to breaks in the mains, so that the fire department could do little to check the fire, which spread chiefly by means of wooden shingles.

organized; fires occurring in residential sections which spread beyond control due to combustible construction, wooden shingle roofs and inadequate protection facilities; and conflagrations resulting from extensive forest and brush fires entering the city over a wide frontage.

Conflagrations create terrific drafts and wind current due to air rushing in to supply fresh oxygen and replace the heated air and gas given off by the great body of fire. Frequently large objects of combustible material are carried aloft for considerable distances unconsumed due to lack of sufficient oxygen to support complete combustion. Heated gases of combustion have been known to travel for considerable distances and then burst into flame, spreading the fire. In addition, due to the terrific heat, conflagrations extend horizontally by means of radiated waves of heat. Exposed buildings burst into flames before any fire reaches them directly. This fact makes exposure protection of utmost importance in combating conflagrations.

There is a popular fallacy that water may increase the intensity of conflagrations, on the theory that the tremendous heat may break up water into its constituent elements, hydrogen and oxygen, the hydrogen subsequently burning to increase the intensity of the fire. It has never been conclusively established that such dissociation of water occurs in conflagrations, and if it does the burning of the hydrogen cannot produce any more heat than was absorbed from the fire in the process of dissociation.

Fighting Conflagrations.

Conflagrations do not usually confine themselves to one fire area, but start many blazes in advance by means of flying brands. This is particularly true in cities where wooden shingle roofs are permitted. Firemen in such cities always find, at a time when their full force should be concentrated on the main fire, that a large number of other fires have started over a wide area, often from the original fire, often resulting in complete overtaxing of the fire protection facilities.

Conflagrations differ from ordinary fires in their spread, and fire officials should study the factors which have caused past conflagrations and the manner in which they were fought, and apply this information to local conditions. Comparatively few firemen have had experience fighting conflagrations, and when a conflagration occurs they are frequently not prepared to meet it. Los Angeles and other progressive fire departments have prepared detailed plans for conflagrations or other major disasters. These plans contain provisions for mobilizing all units which are available and assigning specific functions to each. Besides fire fighting forces such organization plans include units to deal with public health; methods of communication; law and order; public utilities, such as water, gas, electrical, and street departments; and units to provide food, shelter and other relief as necessary. It will be found in a time of disaster that co-ordination of these various activities may be very

The Shreveport, La., conflagration of September 4, 1925, started in a house across the street from the fire department station shown in the picture, and destroyed 196 dwellings with a loss of $1,000,000. The water system was out of service due to breaks in the mains, so that the fire department could do little to check the fire, which spread chiefly by means of wooden shingles.

The Chicago stockyards conflagration, May 19, 1934, with flames sweeping through wooden piers and runways which had been baked by heat and drought. Congested arrangement of the yards made access difficult. The fire was not stopped until it approached wide streets with large water mains. The loss was $4,617,280, including damage to several adjacent blocks.

difficult. However, in any well-organized community each department will automatically perform its own functions. Planning is chiefly necessary to provide for necessary emergency equipment and to let each agency know what details it is to cover.

Many conflagrations have practically burned out, sometimes almost unimpeded by the fire department, which, due to inadequate water supplies, personnel or equipment, was forced to confine its activities to flanking the fire and following up the rear. Experience has shown that heavy streams in large numbers are essential to controlling a conflagration. Ordinary streams from handlines are not only ineffective on a large body of fire, but it is frequently impossible for men to get near enough to use them, due to the great heat. Heavy streams are necessary to reach the burning material and to form a water curtain to protect exposures from waves of radiated heat. Even the largest fire streams do not have an effective range of much over 100 feet, and there is no possible method of applying water to the center of the fire.

Except in very large cities, it is impossible to maintain a fire department large enough to properly combat even a minor conflagration unaided. Plans should be made in advance for a systematic mobilization of substantial outside aid. In such an emergency communication systems are greatly overtaxed and,* unless arrangements have been made in advance, great delays in obtaining help inevitably result. All local resources should be utilized. Offshift firemen should be mobilized, spare apparatus should be equipped ready for service, plans should be made for adequate policing so that right of way may be given to apparatus and so that crowds may not hinder fire fighting operations. Arrangements should be made for supplying adequate fuel for all equipment. Some communities having a serious wooden shingle roof hazard maintain small apparatus with water tanks to serve as "spark chasers" so that the larger apparatus will not have to be diverted from the main fire.

The use of dynamite is often mentioned in connection with conflagrations. Its use should only be as a last resort and as an admission of failure to control the fire by other methods, and it should only be used by explosive experts. The use of dynamite makes it necessary to stop other fire fighting operations in the vicinity. A partially demolished building is more hazardous than one which is intact. An explosion may break windows, water and gas pipes in the vicinity, thus aiding the fire. Only in cases where water supplies are completely interrupted, such as when an earthquake precedes the fire, can the use of explosives prove justifiable.

Forecasting Conflagrations.

Fire protection engineers are able to tell where conflagrations are likely to occur. Congested areas without fire cut-offs and exposure protection, haz-

*A Prearranged Plan for Mutual Aid, N.F.P.A. QUARTERLY, Vol. 28, No. 2, page 130.

The Chicago stockyards conflagration, May 19, 1934, with flames sweeping through wooden piers and runways which had been baked by heat and drought. Congested arrangement of the yards made access difficult. The fire was not stopped until it approached wide streets with large water mains. The loss was $4,617,280, including damage to several adjacent blocks.

ardous occupancies without proper protection, dilapidated fire breeding structures, and numerous wooden shingle roofs are indications of a likelihood of a conflagration.

After locating the hazardous areas it should be realized that weather conditions are the most important indication as to when fires are likely to develop into conflagration proportions. Tests indicate that serious fires are most likely to occur when there is a deficiency of moisture in the air. A long dry spell prepares combustible roofs and exposures for ignition. Conflagrations almost always occur on days of low humidity. This, combined with a high wind, is most serious.

Prevention of Conflagrations.

It is doubtful if the possibility of conflagrations and serious group fires will be entirely eliminated, particularly in the older cities, but the best authorities agree that it can be greatly reduced without any great financial burden. Systematic city planning and zoning is becoming recognized as a means of prevention of future conflagrations. The segregation of hazardous manufacturing operations and removal of particularly dangerous structures from congested sections, provision for wide streets and park areas to facilitate fire fighting and serve as fire breaks, and isolation of fire alarm central stations are among the items in a comprehensive city plan.*

Other means of reducing the conflagration hazard include the following:

1. Requirements for a high standard of building construction for all buildings, particularly in high value districts, by means of a recognized and enforced building code.

2. The elimination of wooden shingles and other combustible roof coverings by means of a suitable ordinance.

3. Adequate exposure protection wherever communicating fires are likely, including fire-resistive buildings. Methods of protection include outside open head sprinkler protection for all wall openings, blank walls with adequate parapets for serious exposure hazard, extensive use of wired glass, metal frame window protection and shutters. Experience has shown that for serious exposure fires more than one form of protection is desirable, and wired glass windows and shutters must be closed to be effective.

4. Conflagration breeders, the term for very dilapidated structures and those in which especially dangerous enterprises are carried on, are easily detected and should not be tolerated in high value districts. Buildings which have served their usefulness and are in a state of disrepair should be condemned and removed.

5. General use of automatic sprinklers, particularly in high value districts and hazardous occupancies. Sprinklers undoubtedly give the greatest measure of protection against conflagration and are the most practical means of reducing existing fire hazards. Sprinklers are economical, as they can pay for themselves in reduced insurance costs. Numerous fires are on record where sprinklers obviously prevented severe exposure fires from developing into conflagrations.

6. Improved public water supplies, including elimination of small and dead-end mains. Installation of a high pressure fire main system in high value sections.

7. Improved fire department efficiency, including improved equipment, better training of firemen and increased man-power where necessary for efficient operation.

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*See N.F.P.A. brochure, City Planning and Fire Protection.

Fertilizer Plant Fire Record.

The fertilizer industry in the United States is concentrated in 599 plants having 14,551 employees and producing products valued at $154,350,000 according to statistics of the U. S. Department of Commerce for 1931, the last year for which figures are available.

The fire record of the industry has not been favorable. Plants are mostly of large size, with high values subject to a single fire. Construction of plants is in general poor, although some of the more modern plants are of improved construction. Due to the obnoxious odors generally associated with the production of fertilizer, plants are usually located away from thickly populated sections and therefore are frequently in locations where public fire department and water supply facilities are limited. The best solution of the problem of fertilizer plant protection has been the installation of automatic sprinklers backed up by an adequate private water supply. The fire record in sprinklered fertilizer plants has been very satisfactory considering the large values involved.

Fertilizers are prepared to supply nitrogen, phosphoric acid, and potash. Materials used to supply nitrogen include waste products of slaughter houses, blood, bones, garbage tankage, press cakes, leather scrap, fish scrap, phosphate rock, and pulverized gypsum. The materials are subjected to steaming, grinding, action of chemicals, and other processes to convert them into fertilizer. Many of the materials used are particularly subject to spontaneous ignition, the greatest single cause of fertilizer plant fires. The use of organic materials as a source of nitrogen has contributed largely to the fire loss record. In recent years the use of these materials has been greatly reduced by the diversion of these materials into the animal feed industry and the use of less hazardous chemicals in the fertilizer industry. This change, together with improved methods of grease extracting, should lessen the hazard of spontaneous ignition.

Materials used to supply phosphoric acid are almost entirely non-flammable chemical compounds. Potash is supplied by non-flammable chemical salts.

This fire record contains 113 fires occurring since January 1920 and reported to the N.F.P.A. Department of Fire Record prior to September, 1935. This number does not include all fires which may have occurred during the period of the record, but does include most of the large loss fires and a sufficient proportion of all fires to give a typical cross section of the fire experience of the industry.

The table on the next page shows the causes of fires. Spontaneous ignition is the greatest single cause of fires, having caused 31.7% of the fires of known cause, and undoubtedly a large proportion of the fires where the cause

Causes of Fires in Fertilizer Plants.

Special Hazard Causes.	No. Fires
Drying Process	7
Overheated bone dryer	4
Ignition of jute bagging on steam table of bone dryer	1
Hot phosphate rock in cylindrical dryer	1
Heat from dryer	1
Grinding Process	4
Friction in grinding mill	1
Foreign material in grinding mill	1
Spontaneous ignition of stock in grinding mill	1
Unknown in grinding mill	1
Spontaneous ignition of raw stock or tankage	17
Fish scrap	5
Animal and bone stock	2
Other raw stock	10
Spontaneous ignition of bagged tankage	2
Spontaneous ignition of oily material	2
Tank house fires	3
Overheated tank heater	1
Hot bearing on washing machine	1
Ignition of naphtha solvent vapors by electric spark	1
Ignition of dust	7
Explosion of fertilizer dust, cause unknown	2
Spontaneous ignition of dust	2
Explosion of dust in grinder	1
Explosion of sulphur dust, due to friction spark	1
Spark from motor ignited dust on windings	1
Miscellaneous special hazard causes	4
Burlap bags ignited by steam pipes	1
Spontaneous ignition of burlap bags	1
Failure of spreader on charging machine	1
Spontaneous ignition in dust from steam kettle	1
Total Special Hazard Causes	46
Common Hazard Causes.	
Electrical Causes	16
Defective or overheated motor	9
Defective wiring or short circuit	4
High voltage entered low voltage circuits	2
Short circuit in generator	1
Exposure	3
Friction of pulley or bearing	2
Smoking—matches	2
*Miscellaneous known causes	13
Total Common Hazard Causes	36
Unknown	29
Unknown—suspicious	2
Total	113

*Causes responsible for one fire each.

Ruins of two adjoining frame waterfront warehouses at Jacksonville, Fla., occupied for the storage of fertilizer stocks, destroyed on the night of December 3, 1931, together with thirty-six railroad freight cars. A steamship at the wharf was damaged. Owing to the nature of the stocks, the fire spread rapidly, accompanied by numerous explosions, one of which demolished the fire wall separating the two warehouses. The loss was approximately $1,000,000.

could not be determined. Among the stocks subject to spontaneous heating are fish scrap, which contains more or less oil and when damp is likely to heat dangerously. Dried fish from which none of the oil has been extracted is even more dangerous. Most animal stocks, such as azotine tankage, horn and bone meal, contain oil and are subject to heating, as are vegetable seeds, such as cottonseed, linseed, and castor oil.

Other outstanding hazards are those connected with drying processes, and the hazards of combustible dusts which are quite prevalent in the processes of fertilizer manufacture and storage. Electrical fires predominate among the common hazard causes. Defective or overheated motors were especially troublesome, being second only to spontaneous ignition as a cause of fires. Attention should be given to the care and maintenance of electrical equipment, as motors are frequently neglected and become clogged with dirt or dust, resulting in overheating and breakdowns, and wiring often becomes short-circuited or overloaded.

Many of the fertilizer plants included in this record manufacture sulphuric acid and other chemicals in addition to fertilizer. Such plants have the hazards of the manufacture of chemicals in addition to the usual hazards of fertilizer factories.

Typical Fires.

OCTOBER 13, 1927, KANSAS CITY, KANS. (H-25045.) Fire due to spontaneous ignition occurred on the upper floors of a four-story brick semi-mill constructed warehouse occupied for the storage of large quantities of garbage tankage and packing house tankage in burlap sacks. The lower floors contained

feed mills and a machine shop. The fire had such great headway on the upper floors when discovered that it could not be controlled before the three top floors were burned out. The loss was approximately $200,000.

DECEMBER 3, 1931, JACKSONVILLE, FLA. (H-34644.) Two large frame waterfront warehouses occupied for storage of fertilizer stocks, including organic fertilizer materials and a large amount of nitrate of soda, were destroyed by a fire. The origin of the fire was attributed to spontaneous ignition of stock. Numerous explosions occurred during the fire, one of which blew down the firewall between the two warehouses, allowing the fire to spread into the second warehouse. Thirty-six freight cars between the two warehouses were also destroyed. The loss amounted to $1,000,000.

NOVEMBER 13, 1933, JACKSONVILLE, FLA. (H-37314.) Fire was caused by spontaneous ignition in a pile of Milorganite stored on the wooden floor in the main building of a frame fertilizer factory. The night watchman called the fire department through a central station alarm, but the fire had burned through the floor and involved the inaccessible under floor space. Fumes and smoke made the fire difficult to control. The loss exceeded $200,000.

FEBRUARY 18, 1935, TAMPA FLA. (H-38989.) Fire occurred at about the center of a large frame iron-clad fertilizer factory, due to spontaneous ignition in a pile of goat manure, which was stored in bulk. This material had shown evidence of heating and was being watched. About 10:30 in the evening the watchman requested the fire department to come and look at the material. The department responded with a chemical truck, but when they arrived the manure was ablaze and the fire had spread to a large pile of bagged nitrate of potash adjoining. The firemen called additional equipment, but by the time it arrived the nitrate of potash had begun to fly in all directions aided by minor explosions, setting fire to the roof and walls as well as the stock in the building. The total loss was approximately $194,000.

Construction of Buildings Involved in Fertilizer Plant Fires.

As indicated above, large areas of sub-standard frame and brick-joisted construction without adequate cut-offs between sections are among the primary reasons for the unfavorable fire record in the industry. As shown in the following table on construction, fire-resistive or incombustible buildings figured in only a small percentage of the fires. The nature of the stock processed in the industry, which involves handling and processing tons of materials, requires large area buildings, and the result has been large buildings of the most inexpensive construction possible.

Construction	No. Fires	%
Frame	54	47.8
Brick	23	20.4
Frame iron-clad	11	9.7
Fire-resistive	7	6.2
Brick and frame	5	4.4
Iron-clad on steel	5	4.4
Protected metal on frame	1	.9
No data	7	6.2
Total	113	100.0

Fire destroyed a fertilizer factory and adjacent railway terminals located on an island in the harbor of Savannah, Ga., on February 14, 1919. The fire, driven by a high wind, could not be reached by the public fire department, and private protection was not adequate to control the severe fire in frame buildings containing highly flammable fertilizers and chemicals. The loss exceeded $2,000,000.

Location in Which Fires Originated.

Fires originated most frequently in warehouse and storage sections. More than one quarter of the fires started in these sections. In most industries there is relatively little hazard in storage sections and the severe hazard existing in the storage of fertilizer materials is almost entirely due to the susceptibility of these materials to spontaneous ignition. The second most hazardous location in fertilizer plants are the dryers. As would normally be expected, the likelihood of fires is increased where heating processes are employed. Grinding sections are also dangerous due to the hazard of foreign materials entering the grinders with fertilizer stocks and striking sparks.

Point of Origin	No. Fires	% of Known Location
Warehouse or storage room	26	26.5
Bone dryer or dryer house	10	10.3
Grinding section	9	9.2
Tank house or dissolving room	7	7.2
Acid chamber or building	6	6.1
Boiler house or room	4	4.1
Roof	4	4.1
Condenser tower or building	2	2.0
Mixing room	2	2.0
Outside or exposure	5	5.1
Tallow or grease house	2	2.0
*Miscellaneous known locations	21	21.4
Total known locations	98	100.0
No data as to location	15	
Total	113	

*Locations in which not over one fire occurred.

Automatic Sprinkler Operation in Fertilizer Plants.

Automatic sprinklers have an exceptionally fine record in fertilizer plants when the hazards of large open areas and generally inferior construction found in such plants are considered. It may be fairly stated that in many cases automatic sprinklers provide the only satisfactory means of fire protection for such plants. Fertilizer plants are generally located in outlying portions of cities, or in small communities, in both of which cases available water supplies are generally insufficient to combat serious fires in large plants of frame or brick-joisted construction. Unless a fire is controlled promptly, a total loss frequently results. This is illustrated by the fact that 29.4% of the fires in unsprinklered fertilizer factories reported to the N.F.P.A. Department of Fire Record involved losses in excess of $100,000. In sprinklered plants, however, there were but two losses in excess of $10,000.

Effect of Sprinklers	Wet Systems	Dry Systems	Total
Extinguished fire	2	9	11
Held fire in check	0	4	4
Total Satisfactory	2	13	15
Unsatisfactory	1	0	1
Total Sprinkler Operation	3	13	16
Sprinklers did not operate			16
Total			32

Note: The one case of unsatisfactory operation was due to a fire starting in unsprinklered portions gaining such headway that it destroyed sprinklered sections.

The following tables show a comparison of losses in sprinklered and unsprinklered fertilizer plants. The first table gives the number and percentage of large and small losses for both sprinklered and unsprinklered property and the second table shows the actual amount of damage incurred in fires of known loss.

Analysis of Fertilizer Plant Losses.

	Sprinklered		Unsprinklered		Total	
Loss	Fires	Per Cent	Fires	Per Cent	Fires	Per Cent
Small loss (under $1,000)	21	67.7	19	28.0	40	40.4
$1,000 but under $10,000	8	25.8	9	13.2	17	17.2
$10,000 but under $25,000	0	.0	3	4.4	3	3.0
$25,000 but under $100,000	2	6.5	17	25.0	19	19.2
Over $100,000	..	.0	20	29.4	20	20.2
Total Known Loss	31	100.0	68	100.0	99	100.0
Moderate (no figures available)	0		1		1	
Considerable (no figures available)	1		4		5	
Large (no figures available)	0		6		6	
No data as to loss	0		2		2	
Total Fires	32		81		113	

Comparison of Losses—Sprinklered and Unsprinklered Fertilizer Plants.

	Sprinklered Plants			Unsprinklered Plants		
	Fires	Total Loss	Average Loss per Fire	Fires	Total Loss	Average Loss per Fire
Loss under $1,000	7	$3,675	$525	8	$2,559	$320
Loss $1,000 to $4,999	5	9,367	1,873	5	13,451	2,690
Loss $5,000 to $9,999	3	18,001	6,000	4	30,432	7,608
Loss $10,000 to $24,999	0	—	—	3	43,270	14,422
Loss $25,000 to $49,999	0	—	—	9	308,908	34,446
Loss $50,000 to $99,999	2	169,494	84,712	8	450,499	58,312
Over $100,000	0	—	—	20	4,099,917	204,996
Total Fires of Known Loss	17	$200,537	$11,796	57	$4,949,036	$86,822

The following table was prepared to show, from the reports which included this information, what proportion of loss in fertilizer plants was due to damage to buildings and what proportion was due to damage to stocks. It is interesting to notice that in the case of the unsprinklered plants the building loss was considerably greater than the contents loss, while in sprinklered plants only 20.2% of the damage was to buildings, most of the loss being confined to the stock.

	No. Fires	Building Loss Amount	Building Loss %	Contents Loss Amount	Contents Loss %	Total Loss
Unsprinklered Fires.						
Less than $1,000	8	$1,908	74.6	$650	25.4	$2,558
$1,000 to $24,999	7	23,535	64.2	19,900	45.8	43,435
$25,000 to $100,000	10	384,286	70.9	158,122	29.1	542,408
Over $100,000	8	850,755	55.3	688,462	44.7	1,539,217
Total unsprinklered fires	33	$1,260,484	59.3	$867,134	40.7	$2,127,618
Sprinklered Fires.						
Less than $1,000	3	210	20.8	800	79.2	1,010
$1,000-$24,999	7	9,030	42.1	12,436	57.9	21,466
$25,000-$100,000	1	12,068	14.6	70,437	85.4	82,505
Total sprinklered fires	11	$21,308	20.2	$83,673	79.8	$104,981
Total, all fires where data are available	44	$1,281,792	57.5	$950,807	42.5	$2,232,599

Typical Sprinklered Fires.

A few typical fires in which sprinklers operated follow to illustrate their effectiveness in controlling fires in fertilizer plants, even though construction features may be substandard.

NOVEMBER 25, 1925, WEST HAVEN, CONN. (S-41189.) Fire started in large one-story frame fertilizer plant from an unknown cause at 3:45 A.M. A watchman had passed near the spot ten minutes before the sprinkler alarm on the dry valve operated. When he returned in response to the alarm, the fire was too great for first aid appliances and the fire department was called. When they arrived, the sprinklers were holding the fire well in check, despite the fact that heat opened 337 out of 1250 sprinkler heads in the building. Lack of curtain boards in this high studded large area building was the reason for the num-

Fire in a large frame fertilizer plant threatened the town of Gretna, La., on February 27, 1932. The fertilizer plant was destroyed with a loss of $150,000. The town was saved by fire departments from near-by cities and towns.

ber of sprinkler heads opened. The fire pump operated automatically, supplying the sprinklers, but as would be expected some sprinklers had little water. Two hose streams were used to extinguish the fire. The loss was estimated at $82,500, which was mostly due to water damage to stock.

MARCH 15, 1927, BILLERICA, MASS. (S-44415.) Fire occurred in frame roof house of building where mixed ground tankage was sifted. Fire came from the metal elevators which convey tankage from the lower floor and was due to a dust explosion. Fire flashed in the fine dust on the beams and pipes and opened sixteen sprinklers, which practically extinguished the fire. Employees used a line of hose and extinguished the remaining fire. The loss was $300 to building and $4800 to stock.

JANUARY, 1929, EDENTON, N. C. (S-50449.) Fire originated in the starting box of a motor in a one-story frame fertilizer factory. Five automatic sprinkler heads operated and extinguished the fire. The sprinkler gong was heard by the watchman, who called the fire department, but the fire was out when it arrived. The loss to the building was $50. Water damage to stock was $850.

MARCH 1, 1930, WEST HAVEN, CONN. (S-55787.) Fire due to a spark from an open starting box controlling an electric motor occurred in an asbestos lined booth for a motor operating fertilizer mixing machines. There were no sprinklers in the motor booth, but four sprinklers outside the booth operated and held the fire in check. An employee heard the sprinkler alarm operating and used one hose stream to extinguish the fire in the booth. Damage amounted to $850, which was mostly water damage to fertilizer stock.

Taylor Milling Co. Fire, Stockton.

Report by Board of Fire Underwriters of the Pacific.
(Member N.F.P.A.)

An inadequate water supply, the lack of complete sprinkler protection and unprotected openings were responsible for the almost complete destruction of the plant of the Taylor Milling Co. in Stockton, Calif., early on the morning of June 24, 1935, with a loss estimated at $400,000. The fire originated in an unsprinklered warehouse of the plant and although promptly discovered gained great headway and spread first to other warehouses and then to a frame elevator structure on the roof of one of the sprinklered mill buildings. Fire department pumpers responding to a general alarm had deprived the sprinklers of water, which allowed the fire to spread from the elevator through the sprinklered buildings, which were destroyed. The fire department made no attempt to pump into the sprinkler systems.

The plant was occupied for the manufacture of stock and poultry feed and consisted of a five-story brick sprinklered mill building, and a three-story brick sprinklered mill with a frame elevator on the roof. There were also several large one- and two-story brick and frame unsprinklered warehouses. Standard automatic fire doors were installed on all openings from the sprinklered mill sections to the unsprinklered warehouse sections. Evidence after the fire showed that these doors held. However, the walls of the sprinklered sections had plain glass windows overlooking the unsprinklered warehouse in which the fire started.

Story of the Fire.

Fire of unknown cause started in the bag repairing department on the second floor of an unsprinklered two-story brick and corrugated iron warehouse which adjoins and communicates with the sprinklered mill buildings. The fire was discovered by the watchman while making his 4 A.M. round. He immediately telephoned to the fire department from the first floor of the warehouse and then attempted to extinguish the fire with a chemical extinguisher without success, as a large part of the floor was already involved.

In the meantime outsiders employed near by turned in alarms through public fire alarm boxes at 4:06 and 4:07 A.M. When the fire chief arrived one warehouse was entirely involved and the fire had spread through unprotected openings into an adjoining warehouse and was also attacking the sprinklered mill buildings through unprotected windows overlooking the warehouse, causing sprinklers to operate. A general alarm was sounded which brought all equipment and firemen in Stockton, except two relief engines.

As the plant was located on the edge of a deep water channel and Stock-

V. Covert Martin.

Shows firemen with hose stream attempting to protect the five-story brick sprinklered mill building at the left from the fire which originated in the two-story unsprinklered warehouse on the right. The fire department pumper at the right of the picture is taking suction from the channel.

Heat from burning warehouses ignited the frame elevator on the roof of the three-story mill building. Fire in the elevator spread through this building and the adjoining five-story building, due to lack of water for the sprinkler systems.

ton has no fireboat, a pumper was loaded on a barge and the fire was fought from the channel side. During the interval before the arrival of apparatus called on the general alarm, the fire spread with great rapidity and involved three more distant one-story brick warehouses. Two of these warehouses were three hundred and twenty feet long each, and one contained a large amount of nitrate of soda in sacks, which burned with an intense heat. A blank brick wall between these two large warehouses and warehouses of an adjoining plant stopped the spread of the fire at that point with the aid of hose streams.

Shortly after these warehouses were involved the frame elevator on the roof of the three-story sprinklered mill building ignited. The fire traveled down through this building and spread to the adjoining five-story sprinklered mill. The sprinklers in the three-story building operated until the fire department started to draw from the six-inch city main which supplied the sprinklers, bringing the residual pressure in the mains down to ten pounds. The firemen were hampered in their work by the shortage of hydrants and the comparatively small mains in the district, even though several pumpers took suction from the channel. A total of thirty-two streams were employed.

There were five explosions in the sprinklered buildings after they became involved. The five-story mill contained about five tons of sulphur, which added to the fire. The buildings destroyed covered an area of 180 by 575 feet, or 103,500 square feet.

Water Damage Following Sprinklered Fires.

Automatic sprinklers limit the discharge of water to the actual fire area and extinguish fire with only a very small fraction of the water that would otherwise be applied through hose streams. Losses in sprinklered properties, even when fire occurs when the property is unoccupied and water flows for a long time after the fire is extinguished with consequent increased damage, are far less than those in unsprinklered properties where under similar conditions of delayed discovery a total loss may result.

Experience shows that there are many instances when fire is promptly extinguished by the operation of sprinklers, but unnecessary damage results from the continued discharge of water. Prompt attention to any sprinkler system is essential in case of fire if the best results are to be obtained. Particularly when fires occur in buildings while unoccupied, some means of prompt notification of responsible persons is essential. Fire departments or other agencies specializing in the handling of fire emergencies are best equipped to take effective action for minimizing losses, and notification by some form of central station supervisory service or other reliable means for assuring proper response in case of operation of sprinklers is most generally

effective in minimizing losses such as described in this article. Watchmen also play a large part in prompt discovery and proper action when a sprinkler system operates. The proper selection, training and supervision of watchmen is of major importance.

The following record emphasizes in every way the effectiveness of automatic sprinklers. They operated as they were intended to operate and the losses following the fulfillment of their designed function were the result of ineffective human supervision or of notification systems defective in mechanical detail or strategic installation. The typical fires here assembled were promptly extinguished by the sprinklers, but for one reason or another clearly indicated in the record, the water was not shut off promptly after their effective operation, and water continued to be discharged for varying periods of time. Many such cases are reported to the N.F.P.A. Department of Fire Record in which the losses have been trifling. Indicated in this record are those in which, because of unusual delay in shutting off the water, serious loss was occasioned. These fires have been grouped according to the various reasons noted in the reports for their delayed discovery.

Waterproofing of Floors.

This record has another interesting aspect in that it emphasizes the need of more general use of waterproofing for floors and installation of drains and scuppers in buildings where substantial values are exposed to water damage. In many of the typical fires here presented it will be noticed that water from sprinklers operating on the upper floors penetrated through all floors below to the basement, causing large loss to stocks. Had the floors been waterproofed by one of the methods suggested by the N.F.P.A. Committee on Building Construction* and properly drained, it is reasonable to assume that, even if water ran for some time, damage would have been largely confined to the floor on which the fire occurred.

Alarms Not Heard.

Often the sprinkler alarms operate satisfactorily, but are not heard for considerable periods of time. Business and industrial sections are usually more or less deserted during the night and other periods of inactivity. Alarms located inside buildings to give warning to employees are often not audible at any considerable distance outside of the building. The following cases where alarms rang but were not heard are typical:

JANUARY 27, 1926. WOLFEBORO, N. H. SHOE FACTORY. (S-41374)
Time of Alarm: 2 A.M. Wednesday.
Construction: Four-story frame.
Origin: Cutting room, fourth floor.
Remarks: One sprinkler extinguished a fire under a cutting bench. The local sprinkler alarm on the outside of the building evidently rang for

*See N.F.P.A. Proceedings, 1935, page 380.

half an hour or more before attracting attention. Volunteer firemen entering building unnecessarily used a hose stream, adding to the damage.

Loss: $26,000, mostly from water.

JUNE 4, 1927. SAN FRANCISCO, CALIF. MULTIPLE OCCUPANCY. (S-45695)

Time of Alarm: 1:14 A.M. Saturday.

Construction: Five-story brick-joisted.

Origin: Fourth floor.

Remarks: One sprinkler extinguished a small fire during the night, but the rotary gong was located in a light well and could not be heard from the street. An outside watchman saw water running from the building and called a tenant at 12:40 A.M., but did not notify the fire department. Another outside watchman discovered the water running and sounded an alarm through a public box at 1:14 A.M., and at about the same time the tenant arrived and telephoned an alarm. About 5000 gallons of water had run through four floors to basement, damaging contents of several clothing and novelty stores.

Loss: Building and fixtures, $3,025; Stock, $25,742. Damage was principally by water, as fire was confined to one work table.

JULY 1, 1927. CHICAGO, ILL. TENANT MANUFACTURING. (S-45314)

Time of Alarm: 1:20 A.M. Friday.

Construction: Seven-story brick-joisted.

Origin: Hat factory, seventh floor.

Remarks: Three sprinkler heads extinguished a small fire under a work table. After the pressure tanks were emptied the automatic fire pump operated until the floor control valve was closed by firemen. There was no outside gong and as no one was in the building the inside sprinkler bell was of no value. At 1:20 A.M. a policeman noticed water coming out through the front door and sounded an alarm. Six salvage companies spread 201 covers.

Loss: Fire damage was slight, but water damage was very heavy.

DECEMBER 5, 1930. PHILADELPHIA, PA. TENANT CLOTHING FACTORY (S-56548)

Time of Alarm: 11:34 P.M. Friday.

Construction: Five-story brick-joisted.

Origin: Second floor.

Remarks: A small rubbish fire was extinguished by five sprinklers. Due to the late hour, the rotary gong was not promptly heard as no one was near by. A total of 5600 gallons of water was discharged before the fire department arrived in response to the call of an outsider who eventually heard the alarm. The water loss was large to a clothing factory and to a shoe store occupying the first floor and basement.

Loss: Building, $905. Contents, $30,000. Water damage to stock was responsible for most of the loss.

JANUARY 31, 1931. MANCHESTER, N. H. SHOE FACTORY. (S-55524)

Time of Alarm: 2:29 P.M. Saturday.

Construction: Four-story brick, plank and timber.

Origin: Cutting and stitching room, fourth floor.

Remarks: Two sprinklers extinguished a fire after the plant closed on Saturday noon. The sprinklers had evidently been operating for some time before an outsider heard the sprinkler gong.
Loss: $25,000-$30,000. Mostly water damage.

Alarms Heard, But Help Not Summoned.

Alarm gongs or bells quite frequently ring and are heard by outside persons who fail to call the fire department. Many persons are hesitant about calling the fire department, especially when they see no fire or smoke, as is often the case with small fires in sprinklered buildings.

JUNE 11, 1927. CHELSEA, MASS. SHOE FACTORY. (S-45146)
Time of Alarm: 1:22 P.M. Saturday.
Construction: Three-story brick-joisted.
Origin: Stitching room, third floor.
Remarks: A small rubbish fire which was extinguished by one sprinkler occurred after plant closed Saturday noon. The operation of the rotary gong finally attracted attention of a railroad crossing tender near by, who sent a small boy to pull an alarm. The boy was unable to operate the box, so the crossing tender sent him to the fire station. This caused a delay of approximately thirty minutes.
Loss: Fire loss was slight. Water did damage on all floors and caused a loss estimated at $35,000.

DECEMBER 21, 1927. TAMPA, FLA. CIGAR FACTORY. (S-46703)
Time of Alarm: 6:15 A.M. Wednesday.
Construction: Three-story brick-joisted.
Origin: Second floor.
Remarks: Five sprinklers extinguished a fire in joists between the first and second floors. The sprinkler gong operated, probably about 2 A.M., but no one paid any attention as there had previously been numerous false alarms. Finally the hammer came off the gong. Employees coming to work called the fire department at 6:15 A.M., but as no one knew how to shut off sprinklers, water continued to run until 8 A.M.
Loss: $15,000-$20,000, mostly by water.

MAY 3, 1930. PHOENIXVILLE, PA. KNITTING MILL. (S-55529)
Time of Alarm: 5:30 A.M. Saturday.
Construction: Three-story brick, plank and timber.
Origin: Cutting and sewing department, third floor.
Remarks: One sprinkler extinguished fire, but no one paid attention to outside gong. Water ran until plant fireman arrived and shut off system. Watchman at plant across street admitted that he heard sprinkler alarm at 5 A.M., but did nothing.
Loss: $18,770, almost entirely by water.

MAY 11, 1931. FITCHBURG, MASS. COTTON WASTE WAREHOUSE. (S-56843)
Time of Alarm: 4:25 A.M. Monday.
Construction: Three-story brick, plank and timber.
Origin: Storage of cotton and rayon waste, third floor.
Remarks: Neighbors heard sprinkler alarm about 3:05 A.M., but seeing no signs of trouble failed to give an alarm. After about ten minutes

the alarm bell clapper became disconnected. At 3:40 A.M. a policeman discovered water flowing from the building and notified police station. They called the plant manager and then the foreman. The foreman arrived at 4:25 A.M. and called the fire department and shut off the sprinklers. Eleven sprinklers confined the fire to a small area on the third floor. Water reached all floors of the building and also the first floor of adjoining building.

Loss: Heavy.

Delays Occurring With Employees in Building or Near By.

Some plant operators believe that employees on duty or an electric bell in the home of a worker living near by furnish sufficient auxiliary alarm service. The following losses occurred while employees or watchmen were near by at the time the fire occurred.

FEBRUARY 2, 1926. CHELSEA, MASS. SHOE FACTORY. (S-41493)

Time of Alarm: 9:32 P.M. Tuesday.

Construction: Three-story, brick-joisted.

Origin: Making room, second floor.

Remarks: An employee passing the building heard the rotary gong and notified a workman in another building of the plant who called the owner. The owner called the fire department. The firemen found the building well soaked, with sprinklers operating on both the first and second floors. Fifty-five heads had practically extinguished the fire. It is believed that the employee who discovered the fire had turned off sprinklers before the fire was out with the belief that alarm was due to leaking dry valve and then turned sprinklers on again upon discovering fire. This would account for the large number of sprinklers operating. Firemen were delayed in shutting off the water because sprinkler control valves in the basement were under water when they arrived.

Loss: Building loss approximately $750. Contents loss was approximately $20,000, which was largely by water.

MAY 14, 1927. CHICAGO, ILL. TENANT CLOTHING FACTORY. (S-45030)

Time of Alarm: 4:40 P.M.

Construction: Six-story brick, semi-mill.

Origin: Sixth floor.

Remarks: Fire was extinguished by sprinklers and was detected by an occupant of the fifth floor who noticed water dripping through the ceiling. After investigating he directed a fellow employee to call the fire department. The man did so, but in his excitement gave the wrong address. Realizing his mistake the man ran out and pulled a street box. Due to the elapsed time between the first and second call, the work of the salvage corps was greatly handicapped, as the damage by water had been largely done before their arrival.

Loss: Considerable, by water.

AUGUST 7, 1931. QUEBEC, P. Q. TENANT MFG. (S-58773)

Time of Alarm: 12:55 P.M.

Construction: Four-story, brick-joisted.

Origin: Clothing factory, fourth floor.

Remarks: The bell connected to sprinkler system is located in home of a caretaker. The bell operated, but at least ten minutes delay resulted before caretaker reached the plant and called the fire department. Due to obstruction, twenty-two heads had operated, causing large water loss to stocks of woolens and tweeds. The damage was done before firemen arrived.

Loss: Building, $796. Contents, $21,358. Mostly water damage.

Failure to Call Fire Department Promptly.

The following are typical of the delays in calling the fire department, which may occur even when the local alarm bell is heard promptly by persons on the premises. In one of the following fires the owner was promptly notified by telephone, but by the time his son had investigated and called the fire department a large water loss occurred. In the other case the loss was fortunately small, but it has been included in the record as an illustration of the roundabout way alarms may be transmitted, with consequent delay, when there is no arrangement made for transmission to the fire department.

FEBRUARY 2, 1925. HAMILTON, OHIO. WASHING MACHINE MFG. (S-39293)

Time of Alarm: 2:10 A.M. Monday.

Construction: One-story brick.

Origin: Storeroom, first floor.

Remarks: The owner of the plant was called by telephone by a resident near the plant and told that the local sprinkler bell had been ringing for ten minutes. The owner sent his son to investigate. He saw smoke upon arrival and pulled an alarm. Firemen found that thirteen sprinklers had extinguished a fire, and they shut off the system, which by that time had operated for forty minutes.

Loss: Fire damage was small. Water damage was large.

NOVEMBER 26, 1926. BUFFALO, N. Y. MULTIPLE OCCUPANCY. (S-44484)

Time of Alarm: 5 A.M. Friday.

Construction: Two-story, brick-joisted.

Origin: Boiler room.

Remarks: One sprinkler extinguished fire, but alarm to fire department was delayed. The rotary gong was operating before 3:15 A.M. Patients in a near-by hospital were annoyed and police were notified. An officer was directed to investigate and he called the proprietor of one of the stores. There was no trouble in this store and so the proprietor called the building owner. The owner called the fire department when he arrived. Firemen responding to the alarm transmitted at 5 A.M. found about a foot of water in the boiler room.

Loss: There was no fire damage. Water damaged boiler covering.

Failure of Local Alarm Devices.

In many cases where sprinklers continue to operate for excessive periods after fires are extinguished the failure of local sprinkler alarm devices to operate is responsible. The local sprinkler alarm, properly installed and maintained, has an excellent record of field experience, and the failures recorded in the fires described below are exceptional cases, practically all due to lack of proper

maintenance. Several instances are recorded where both the electrical and mechanical alarm devices were inoperative at the same time. Water motor gongs were in some instances clogged with rust and sediment and electric bells failed, due to run-down batteries or other causes. In one case the alarm device was tampered with and made inoperative by an incendiarist. In a large proportion of the losses after the fire or waterflow was discovered further delays resulted due to a lack of understanding on the part of the person discovering the fire as to what procedure to take. When water is found running and the alarm bell fails to ring the supposition frequently is that plumbing has broken and the owner of the building is often called to investigate instead of promptly calling the fire department.

MARCH 17, 1926. ALBANY, N. Y. MERCANTILE AND OFFICES. (S-41873)
Time of Alarm: 4 A.M. Wednesday.
Construction: Four story, brick-joisted.
Origin: Piano refinishing room, fourth floor.
Remarks: Fire occurred and was extinguished by two sprinklers some time after the store closed. The small electric bell furnishing the only alarm service did not operate. Water was discovered running by the plant fireman when he entered the building at 4 A.M. Being unfamiliar with the valves, he closed the wrong ones and water continued to flow an hour longer until the building superintendent arrived and shut off sprinklers. There were two feet of water in the basement.
Loss. Fire loss very small. Water loss, $10,000.

MAY 10, 1927. MONTREAL, P. Q. MULTIPLE OCCUPANCY. (S-45015)
Time of Alarm: 8:18 A.M. Tuesday.
Construction: Three-story, brick-joisted.
Origin: Bowling alley, second floor.
Remarks: Two sprinklers extinguished a fire. The rotary gong did not operate, as the stop clock on the alarm valve was shut. A policeman saw water coming from under the door at 5 A.M. and called the water department, who arrived at 6 A.M. Without further investigation they shut the street valves. No salvage work was done until employees arrived at work at 8:18 and called the fire department.
Loss: Fire loss moderate. Water damage considerable to stocks of dry goods store and five and ten cent store on first floor.

OCTOBER 11, 1927. CHICAGO, ILL. FURNITURE STORE. (S-45934)
Time of Alarm: 7:40 A.M.
Construction: Four-story, brick-joisted and semi-mill.
Origin: Second floor window alcove.
Remarks: One sprinkler operated and extinguished a fire during the night. The outside gong did not operate, as batteries were run down. A porter coming to work in the morning called the fire department, but gave the wrong address. Finding no fire at the location given, the firemen returned to quarters. Thirteen minutes later they received another call to the wrong location, but were met on the street and directed to the correct address by the porter.
Loss: Small by fire. Considerable by water.

Fire patrol crew at work salvaging contents of a furniture store deluged by water from sprinklers. Failure to shut off the water after a small fire was extinguished resulted in $50,000 water damage.

FEBRUARY 12, 1928. WINSTON-SALEM, N. C. MERCANTILE. (S-47043)
Time of Alarm: 4:17 A.M. Sunday.
Construction: Three-story, brick, plank and timber.
Origin: Stock cabinet, first floor.
Remarks: Six sprinklers extinguished a fire in a store, but the water gong was inoperative and water ran for some time until a policeman noticed smoke and called firemen. They called the proprietor of the store, but failed to shut off the sprinklers until 5:15 A.M., just before proprietor arrived. The sprinkler alarm was known to be inoperative prior to the fire, but nothing had been done to remedy the condition.
Loss: $9,000. Loss was principally from water. Fire was confined to one cabinet.

APRIL 20, 1928. PHILADELPHIA, PA. TENANT MERCANTILES. (S-47840)
Time of Alarm: 1:30 A.M. Friday.
Construction: Four-story, brick-joisted.
Origin: Third floor.
Remarks: Four sprinklers extinguished a fire, but water continued to run until the 5000-gallon tank was exhausted. The trouble was not discovered until water ran out of doors. Fire was considered to be of questionable origin, as the sprinkler gong had been tampered with and the occupant where the fire started was greatly overinsured.
Loss: Losses to tenants on three floors totaled $15,307, largely by water.

MAY 6, 1928. CAMBRIDGE, MASS. TENANT MFG. (S-47386)
Time of Alarm: 8 P.M. Sunday.
Construction: Six-story, concrete.

Origin: Fourth floor.

Remarks: One sprinkler extinguished a fire, but the sprinkler gong failed to operate, although it has been tested and found satisfactory two days before. Water ran for several hours until an outsider noticed water flowing out of a doorway and called the fire department. Concrete floors did not prove water tight due to faulty joints in floors, and tenants from the fourth floor to the basement suffered water damage.

Loss: Est., $10,610, including $166 to building. Chiefly water damage.

JULY 6, 1930. NORTH SYDNEY, N. S. DEPARTMENT STORE. (S-56589)

Time of Alarm: 4:15 A.M. Sunday.

Construction: Four-story, concrete fire-resistive.

Origin: Gentlemen's furnishings department, first floor.

Remarks: Some time after the store closed at 11 P.M. a fire occurred. The fire was confined to the place of origin, but the heat opened twenty-seven sprinklers. The mechanical gong failed to operate, due to a bird's nest in the rotary hood. Water continued to run until an outsider heard the inside electric bell and called the fire department. Additional delay occurred before someone who knew how to shut off sprinklers was located.

Loss: Building $3300. Furniture and fixtures, $3000. Stock, $8649. A large proportion of the loss was by water.

MARCH 23, 1932. CHELSEA, MASS. SHOE FACTORY. (S-60645)

Time of Alarm: 12:08 A.M.

Construction: Three-story, brick-joisted.

Origin: Cutting and stitching room, third floor.

Remarks: A passer-by saw water flowing from the building and called the fire department. The fire department found water being discharged from nearly all the sprinklers on the top floor (61 heads), and the fire practically out. Neither the rotary nor electric alarm bell operated. The electric bell failed, due to a displacement of the vibrator. The pipe leading to the rotary gong was obstructed by scale. Structural damage by fire was slight, but the building was wet down throughout, and contents, including stock in process, were drenched. Over two feet of water collected in the basement. Evidently the sprinklers had been in operation for a considerable time before the trouble was discovered.

Loss: Est., $50,000.

DECEMBER 5, 1932. BINGHAMTON, N. Y. TENANT MFG. (S-62423)

Time of Alarm: 10:27 P.M. Monday.

Construction: Four-story, brick-joisted.

Origin: Paper novelty factory, third floor.

Remarks: An outsider noticed water running from under doors and notified firemen at a near-by station, who found that five sprinklers had entirely extinguished a fire. The lower floors were flooded with water and firemen chopped holes to let water run into basement. The water motor gong did not operate, as screen was plugged with rust and sediment.

Loss: Est., $40,000. Largely water damage. Most of the damage was to stock of a wholesale drug concern occupying the basement, first and second floors.

APRIL 15, 1934. WORCESTER, MASS. FURNITURE STORE. (S-66560)
Time of Alarm: 1:05 P.M. Sunday.
Construction: Five-story, brick, plank and timber on exposed steel.
Origin: Furniture show room, fifth floor.
Remarks: One sprinkler extinguished a small fire, but due to failure of the local sprinkler gong water ran for hours until an outsider saw water running through ceiling of store on first floor. The inside electric sprinkler alarm bell operated, but was not audible outside the building. Water penetrated all floors, causing part of the ceiling to fall in a tenant jewelry store on the first floor. While firemen were in the building an electrical short circuit caused by the water started a small fire in the jewelry store.
Loss: Est., $50,000-$100,000. Mostly by water.

DECEMBER 8, 1934. ST. PAUL, MINN. FURNITURE STORE. (S-68243)
Time of Alarm: 6:25 A.M. Saturday.
Construction: Four-story, brick-joisted and plank and timber.
Origin: Sprinkler tank room, fourth floor.
Remarks: Eleven sprinklers extinguished a fire, but the local sprinkler gong failed to operate. Water ran for hours until an employee in an adjoining building discovered water seeping into basement and gave alarm.
Loss: Building, $12,000. Contents, $35,000. Mostly water damage.

Fires in Which There Was Loss of Life.

Third Quarter, 1935.

Since the publication of the July QUARTERLY, the N.F.P.A. Department of Fire Record has received from various sources 173 reports of fires in which there has been loss of life. A total of 269 lives were lost in these fires. During this period the following fires were reported in the United States, which caused the loss of more than five lives each.

JUNE 15, 1935. NEW YORK, N. Y. Eight persons, including two men and six women, were fatally injured, fifty persons were seriously burned or injured and many others were less seriously hurt when fire swept the main ballroom of a public hall, just before a wedding ceremony was to have started in the presence of approximately three hundred and fifty persons. Panic resulted when cloth and paper decorations festooning the ceiling took fire. As the corridor leading to the street became jammed by persons struggling to reach the door, many ran upstairs, seeking to escape. Approximately twenty persons from the crowd on the second floor were injured by jumping from windows before the firemen arrived.

JULY 17, 1935. VAN LEER, KY. Nine men were trapped and killed by a gas explosion in a coal mine.

SEPTEMBER 8, 1935. ALMA, COL. Six men lost their lives when a frame bunk house at a gold mine was destroyed by a night fire. Twelve others broke down a grating on the window and escaped. Five of the victims were trapped inside and one died in a hospital.

Causes of Loss of Life, July-September, 1935.

Fatalities classified according to the immediate cause of the loss of life rather than according to the cause of the fire.

	Men	Women	Children	No Data	Total
Airplane fires	11	1	0	0	12
Automobile fires	14	3	2	0	19
Chemicals and explosives:					
Munitions factory	0	1	0	0	1
Children alone in house	0	0	7	0	7
Children and matches	0	0	2	0	2
Clothing ignited:					
Adjusting oil furnace	0	1	0	0	1
Bonfire	0	1	3	0	4
Joker ignited comedian's "hula" skirt	1	0	0	0	1
Match	0	1	0	0	1
Spark from electric greasing gun	1	0	0	0	1
Stove or heater	0	0	1	0	1
No data	1	0	0	0	1
Electrical burns	2	0	0	0	2
Entering or re-entering burning building	3	0	0	0	3
Escaping from boat fire—drowned	5	0	1	0	6
Escaping from fire—jumped	1	0	1	0	2
Escaping from fire—struck by locomotive	1	0	0	0	1
Explosions (miscellaneous):					
Acetylene gas	1	0	0	0	1
Aluminum powder	3	0	0	0	3
Electrical transformer	4	0	0	0	4
Gasoline pumping station	2	0	0	0	2
Gas well	2	0	0	0	2
Illuminating gas	1	2	0	0	3
Marsh gas in water works crib	1	0	0	0	1
Oil refineries	5	0	0	0	5
Fire fighting—firemen	2	0	0	0	2
Fireworks	3	0	2	1	6
Flammable liquids or vapors:					
Alcohol spilled on clothing ignited	2	0	0	0	2
Alcohol thrown on bonfire by children	0	0	1	0	1
Cleaning with gasoline	1	8	6	0	15
Firecracker thrown in naphtha tank	0	0	1	0	1
Gasoline barge explosion	2	0	0	0	2
Gasoline in barrel ignited	0	1	0	0	1
Gasoline placed on stove	0	0	3	0	3
Gasoline poured on brush fire	1	0	0	0	1
Gasoline spilled on clothing ignited	0	0	2	0	2
Gasoline soaked mop ignited by open flame	1	0	0	0	1
Gasoline storage tank overflowed and ignited	1	0	0	0	1
Gasoline stove explosion	0	3	0	0	3
Gasoline tank leaking, vapor ignited by lantern	0	1	0	0	1
Gasoline tank truck explosion	2	0	0	0	2
Gasoline tank on fire exploded while being carried from building	1	0	0	0	1

	Men	Women	Children	No Data	Total
Gasoline torch exploded	1	0	0	0	1
Gasoline vapor ignited by match	0	1	2	0	3
Gasoline vapor at oil station ignited by truck motor	1	0	0	0	1
Gasoline used to start fire	2	2	3	0	7
Gasoline explosion—no data	1	0	0	0	1
Kerosene spilled on clothing ignited by open flame	0	1	0	0	1
Kerosene used to start fire	1	6	1	0	8
Oil stove or lamp	2	2	3	0	7
Paint remover ignited	1	0	0	0	1
Varnish thinner vapor exploded	1	0	0	0	1
Welding oil tank truck with acetylene torch	1	0	0	0	1
Mine fires	9	0	0	0	9
Motorboats and yachts (exclusive of drowning)	7	0	0	0	7
Overcome by smoke—suffocation	2	2	1	0	5
Overexertion or excitement	4	0	0	0	4
Railroad car fires following wrecks	22	0	0	0	22
Response to alarms	2	0	0	0	2
Shot for burglar while warning occupants of fire	1	0	0	0	1
Smoking in bed	1	2	0	0	3
Trapped in burning building	18	14	15	0	47
Trapped in forest or brush fire	3	0	0	0	3
No data	1	0	2	0	3
Total	156	53	59	1	269

Loss of Life Fires, July-September, 1935.*

This is a typical rather than a complete record, presented to show the conditions under which loss of life occurs, that they may be known and guarded against. The total loss of life by fire in the United States is estimated at 10,000 annually.

Class of Fire	No. Fires	Men	Women	Children	No Data	Total
Airplane fires	4	11	1	0	0	12
Apartments, hotels, lodgings, tenements, etc.	11	6	6	3	0	15
Automobile fires	13	14	3	2	0	19
Barns	2	1	0	1	0	2
Distilleries	3	3	0	0	0	3
Dwellings—Rural	31	6	14	31	0	51
Dwellings—Urban	31	5	17	10	0	32
Forest or brush fire	3	3	0	0	0	3
Garages	4	4	0	0	0	4
Gasoline or oil tank-truck	4	4	0	0	0	4
Gas well	1	2	0	0	0	2
Industrial occupancies	4	7	0	0	0	7
Mercantiles	1	1	0	0	0	1
Mining property	2	15	0	0	0	15
Motorboats and yachts	8	13	0	1	0	14
Munitions factory	1	0	1	0	0	1
Oil distributing plants	3	4	0	0	0	4
Oil refineries	2	5	0	0	0	5
Other buildings	9	12	7	0	0	19
Outside of buildings	25	9	4	11	1	25
Railroad accidents	3	22	0	0	0	22
Response to alarms	2	2	0	0	0	2
Tank barge	1	2	0	0	0	2
No data	5	5	0	0	0	5
Total	173	156	53	59	1	269

Typical Loss of Life Fires.

Alcohol Thrown on Bonfire by Children.

L-3164. MANCHESTER, MASS., SEPTEMBER 6, 1935. A six-year-old girl was fatally burned and her seven-year-old brother was seriously burned as a result of playing with a bonfire in the rear of their home. The children found a small bottle of alcohol which they believed to be water and threw it on the fire. The alcohol exploded, setting fire to their clothing.

Carrying Burning Gasoline Tank from Barn.

H-39827-H. INDIANAPOLIS, IND., JULY 9, 1935. A man was fatally burned when he seized a flaming gasoline tank and carried it out of a burning barn. The tank exploded in his hands. The fire started while tractors were being filled with gasoline.

Children Alone in House.

L-3166. TULAMEEN, B. C. AUGUST 25, 1935. Three children, the oldest aged four, lost their lives when left alone in their farm house for a few minutes. Their mother started a fire in the kitchen stove and went to the barn to milk the cow. Returning to find the house in flames she rushed inside and carried out the baby, who had been fatally burned, but she could not reach the other children.

Cleaning with Gasoline.

H-39827-A. OTIS, KAN., JULY 5, 1935. A young woman was fatally burned and her husband was critically burned when gasoline which they intended to use for dry cleaning in the cellar of their home exploded. The gasoline was in a two-gallon container, which was leaking, and vapor ignited from a lighted lantern. The resulting explosion blew the door firmly shut, trapping the couple in the blazing cellar until the man broke down the door. They went to a neighbor's house for aid and called for two hours before they aroused anyone, as the accident occurred late at night.

L-3167. BUCKINGHAM COURTHOUSE, VA., AUGUST 20, 1935. A mother and three children were burned to death when gasoline, being used to clean a bed, ignited. The gasoline was being sprayed on when a match was struck for light. There was a flash of fire and the house was ablaze. Two occupants escaped from the first floor, but the victims on the second floor could not be reached, and no fire equipment was available with which to fight the fire.

Cleaning Floor with Gasoline.

L-3169. OAKLAND, CALIF., JUNE 25, 1935. A man was burned to death when he used a gasoline soaked mop to clean a floor. Gasoline fumes were ignited by the pilot light of a gas heater in the room. Flames from gasoline

*This table is made up from those reports received by the Department of Fire Record between June 18, 1935, and September 18, 1935. A few of the fires included herein occurred prior to June 18, but were not reported until subsequent to that date.

on the floor ignited the victim's clothing. While attempting to escape, a pail of gasoline was overturned. The man then rolled on the floor, attempting to put out the fire, but soaked up more gasoline. Another employee in the building turned a fire extinguisher on the victim and dragged him from the room, but not before he had been fatally burned.

Gasoline Placed on Stove.

L-3159. LOYALTON, S. D., JUNE 10, 1935. A seven-year-old girl died of burns received, when her mother placed a pail of gasoline on the stove while she went out to get water. The gasoline ignited and the girl attempted to carry it outside. Two other children were injured in the fire. The reason for putting gasoline on the stove was not given.

Gasoline Used to Start Fire.

H-39827-M. SEARL'S RIDGE, ILL., JULY 23, 1935. A woman was fatally burned when she poured gasoline on a stove fire, believing it was kerosene. Gasoline and kerosene containers were kept beside each other in the woodshed.

Illuminating Gas Explosion.

L-3162. BROOKLYN, N. Y. SEPTEMBER 14, 1935. A man was killed and three other persons were injured by an explosion of illuminating gas in a dwelling. Gas escaping from a leak in the kitchen was ignited by a pilot light on the stove, causing a severe explosion.

Overcome by Smoke—Suffocation.

L-3165. NEW YORK, N. Y., SEPTEMBER 2, 1935. A man was overcome by smoke and died of suffocation as a result of a fire in his apartment. The fire started in a Morris chair in the living room, probably due to a cigarette, and dense smoke filled the apartment. Firemen found the victim in the kitchen. An emergency squad used five tanks of oxygen in an unsuccessful attempt to revive him.

L-3163. LEWISTON, ME., SEPTEMBER 19, 1935. A woman died of suffocation from an early morning fire in her home. The fire started in a couch on the first floor and smoke entered the woman's second floor bedroom through a ventilator and an open stairway.

Trapped in Burning Building.

L-3158. MORNEAULT, N. B., AUGUST 18, 1935. Five children, sleeping on the second floor of their farm house, were trapped by a fire resulting from a defective chimney. An aunt of the children jumped from a window and escaped, but flames made it impossible for her to reach the children. The parents and two other children escaped from the first floor.

Welding Oil Tank Truck.

H-39827-O. SOMERSET, KY., JULY 3, 1935. A man was killed by an explosion which occurred while he was using an acetylene torch to weld the oil tank of an oil delivery truck. Vapor in the tank exploded and the victim was thrown sixty feet by the blast. A helper was injured.

NO MORE HAZARDOUS

THAN NEWSPRINT PAPER

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ALL Eastman X-ray, Dental X-ray, and Cardiographic Films are made on "safety" base exclusively. And in ordering other Eastman films for clinical photography—*Process, Portrait Panchromatic, Par Speed* and *Super Speed Portrait*—simply specify "safety" base in order to get, at no extra cost, film that is no more hazardous than newsprint paper. Eastman Kodak Company, Rochester, N. Y.

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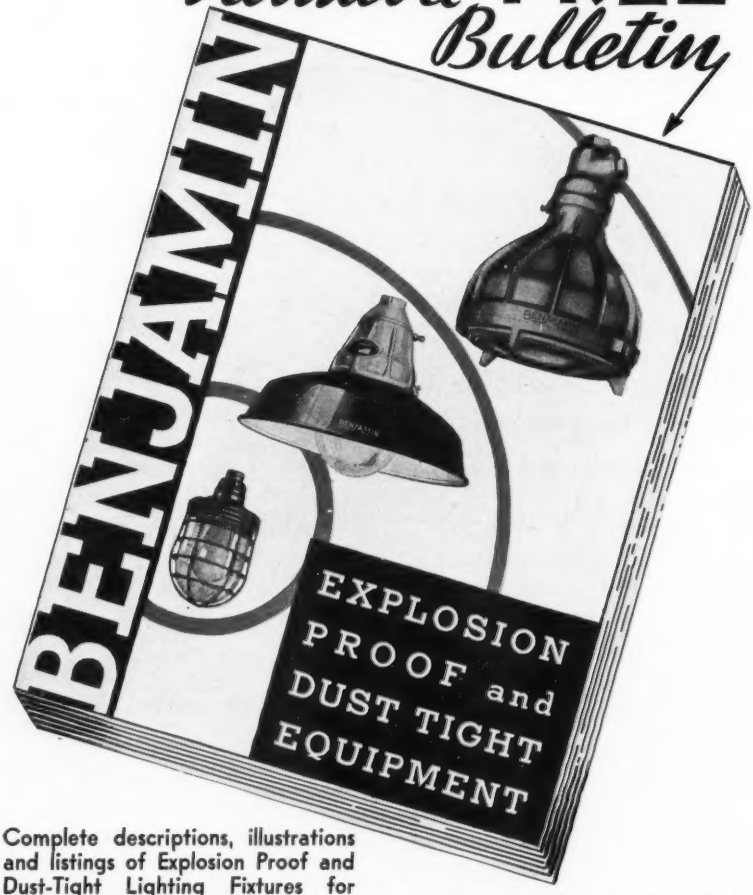

Complete descriptions, illustrations and listings of Explosion Proof and Dust-Tight Lighting Fixtures for Safe Lighting of Class I, Group D; Class II, Group G, and Classes III and IV Hazardous Locations. Also Dust-Tight, Nofuze Panelboards for Grain Elevators and Similar Dusty Locations.

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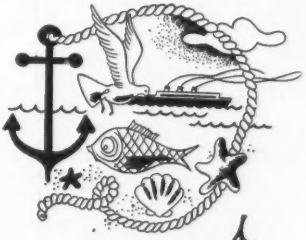
The season's due for a change of scene...



HOW ABOUT YOU?

A sojourn at Chalfonte-Haddon Hall is good for you at any time. But right now there's that rare blend of tardy summer and mellowing fall in the air to make it especially piquant.

A sunny chair is all set for you on our long Ocean Decks. From it you may count the combers as they laze in from the horizon, watch the weaving pageant along the Boardwalk at your feet, or doze to the drone of the surf. Yet there's a tonic in the sea air that makes you crave action too. Then golf, ride horseback on the sand, or play a fast game of squash on our courts. Also concerts, dances, game rooms, and varied entertainment in the hotels to heighten the pleasure of your stay. Cheerful rooms. Heartening food.

$7 up at Chalfonte, $8 up at Haddon Hall, single, American Plan. $5 up at Haddon Hall, single, European Plan. Special weekly rates.

LEEDS AND LIPPINCOTT COMPANY

Chalfonte-Haddon Hall

ATLANTIC CITY

"FIRE is a good servant but a BAD MASTER"
KEEP IT UNDER CONTROL
THIS POSTER PREPARED AND DISTRIBUTED BY THE AUTOMOBILE INSURANCE COMPANY IN THE INTERESTS OF FIRE PREVENTION

Declaring War On FIRE

IT is *time* to declare war on fire. Dwelling fires have increased about 40 per cent in the last ten years. Approximately 7,000 persons, half of whom are children, lose their lives in such fires in the course of a year. These lives and millions of dollars' worth of property continue to be lost each year as the result of fires which for the most part *could* be prevented.

Agents of The Automobile Insurance Company and of The Standard Fire Insurance Company have available a comprehensive educational program designed to help prevent home fires. In addition to the new motion picture film, "The Bad Master," there are posters similar to the one illustrated, booklets on home fire prevention and other printed matter.

Our representatives are invited to make use of this material to the end that lives and property which are needlessly destroyed through carelessness may be saved.

THE AUTOMOBILE INSURANCE COMPANY
AND
THE STANDARD FIRE INSURANCE COMPANY
OF HARTFORD, CONNECTICUT
affiliated with
THE ÆTNA LIFE INSURANCE COMPANY—THE ÆTNA CASUALTY AND SURETY COMPANY

DETECTION
A *First* PRINCIPLE IN FIRE PROTECTION

THE WATCHMAN is generally recognized as fundamental in insurance engineering and fire prevention practice. The system that checks the watchman is granted equal importance.

A Detex Watchmen's system is the simplest, most economical way of making watchmen's service efficient. Detex Watchman's Clocks are the product of a company building watchmen's systems exclusively for more than 50 years—with 80,000 clocks in use in 50,000 systems.

The complete Detex line includes more than a dozen models: Portable —Electric—Stationary—Watchman's Clocks—each designed to serve a particular purpose. . . .

Among them there is one that will best meet any plant's requirements.

Detex Watchman's Clocks are approved by the Underwriters' Laboratories, Inc., and by Factory Mutual Laboratory.

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WATCHMEN'S CLOCKS

NEWMAN ★ ECO ★ ALERT ★ PATROL

Sprinkler systems vary in quality about as much as anything you buy. You get about what you pay for. A real sprinkler system —if it is to give proper protection over a period of years—is more than a simple collection of pipes, valves, fittings, and devices. Protection of the building and safety of its occupants depend on the quality that has been built into the system. The best you can get is the least you should take.

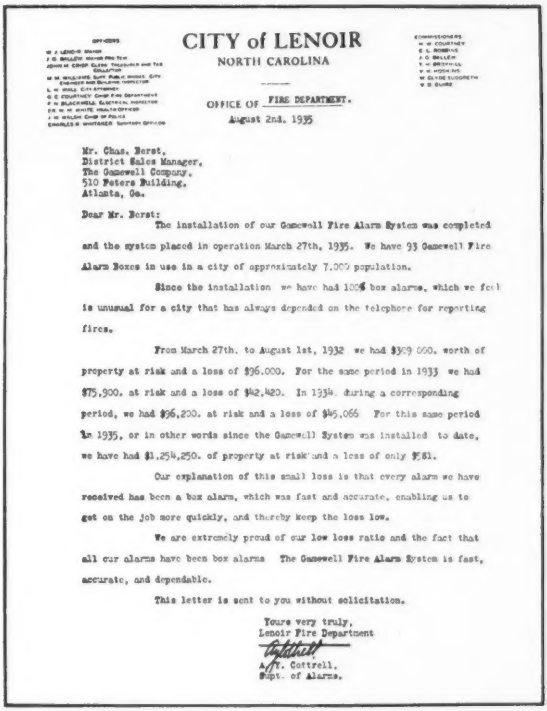
A new bulletin, "12,000,000 Rockwood Sprinklers," describes the Rockwood Certifire System. Ask for your copy.

ROCKWOOD SPRINKLER COMPANY

WORCESTER, MASS. **CHICAGO, ILL.**

Branches in leading cities

Startling REDUCTION in Fire Losses at Lenoir, N. C., Demonstrates Value of GAMEWELL Fire Alarm Systems



CITY of LENOIR
NORTH CAROLINA

OFFICE OF FIRE DEPARTMENT.
August 2nd. 1935

Mr. Chas. Berst,
District Sales Manager,
The Gamewell Company,
510 Peters Building,
Atlanta, Ga.

Dear Mr. Berst:

The installation of our Gamewell Fire Alarm System was completed and the system placed in operation March 27th, 1935. We have 93 Gamewell Fire Alarm Boxes in use in a city of approximately 7,000 population.

Since the installation we have had 100% box alarms, which we feel is unusual for a city that has always depended on the telephone for reporting fires.

From March 27th. to August 1st, 1932 we had $309,060. worth of property at risk and a loss of $96,000. For the same period in 1933 we had $75,900. at risk and a loss of $42,420. In 1934, during a corresponding period, we had $96,200. at risk and a loss of $45,066. For this same period in 1935, or in other words since the Gamewell System was installed to date, we have had $1,254,250. of property at risk and a loss of only $581.

Our explanation of this small loss is that every alarm we have received has been a box alarm, which was fast and accurate, enabling us to get on the job more quickly, and thereby keep the loss low.

We are extremely proud of our low loss ratio and the fact that all our alarms have been box alarms. The Gamewell Fire Alarm System is fast, accurate, and dependable.

This letter is sent to you without solicitation.

Yours very truly,
Lenoir Fire Department
A. T. Cottrell,
Supt. of Alarms.

Lenoir, N. C., has just provided us with a striking example of the value of a Gamewell municipal fire alarm system that should be of interest to every fire insurance official. During a four months period they received 100% box alarms, which reduced their fire losses to $581 against an average four months fire loss of $61,162 for the three years prior to the installation of the new system, when the city relied entirely on telephones for the transmission of fire alarms.

Adequate fire alarm box distribution played an important part in producing such a high percentage of box alarms. Lenoir, with a population of about 7000, has 93 Gamewell fire alarm boxes on its streets. If you are interested, write for a copy of our booklet NF700, telling how to plan fire alarm box distribution.

THE GAMEWELL COMPANY
NEWTON, MASSACHUSETTS

The Volunteer Fire Company

By William Draper Brinckloe

CONTENTS

I. Let's Have a Fire Company

II. Buying the Engine

III. Hose and Helmets

IV. Chiefs and Chaplains

V. Building the Engine-House

VI. When the Siren Sounds

VII. Dollars and Cents

VIII. Brass Buttons

IX. Safety First

X. Be It Enacted:

XI. Getting Together

XII. Fire Prevention

XIII. The Private Fire Company

XIV. Books and Bulletins

The author of this new book describes himself as "an old volunteer fireman from a very old company." Mr. Brinckloe was the leading spirit in the organization of the Volunteer Firemen's Section of the N.F.P.A. Written for the use of volunteer fire companies, private fire departments, farmers' organizations, civic organizations, women's clubs, firemen's schools, insurance men and citizens generally, *The Volunteer Fire Company* is not in any sense a textbook, but an intensely interesting story of volunteer fire departments and volunteer firemen. A dozen leading fire protection engineers who reviewed the manuscript for technical accuracy all reported they found the text as interesting reading as a good novel and could not put it down until they had read every page. Mr. Brinckloe, as President of the Easton, Maryland, Fire Department, the Maryland State Firemen's Association and other fire fighting organizations, a member of the American Institute of Architects, the American Society of Agricultural Engineers, the American Legion and other organizations and a writer of national reputation, presents this story which is at once fascinating reading and technically accurate. The book is sponsored by the Committee on Farm Fire Protection of the National Fire Protection Association, which has reviewed it and finds all its recommendations consistent with the official standards of the Association.

The book is an attractive cloth bound volume of 168 pages with 24 illustrations of volunteer fire department apparatus, equipment and fire fighting methods. The book is published by the National Fire Protection Association at the nominal charge of $1 per copy, postpaid.

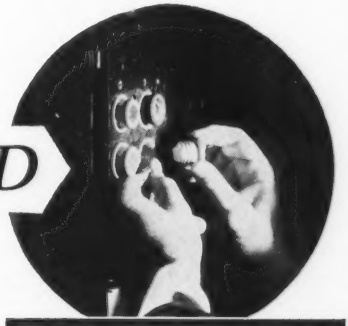
NATIONAL FIRE PROTECTION ASSOCIATION

60 Batterymarch St., Boston, Mass.

NOFUZE WIRING PROTECTION

banishes

THIS HAZARD



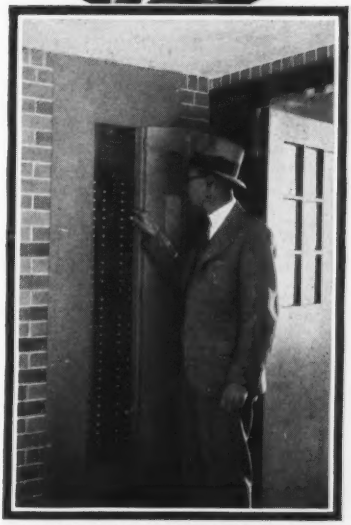
IN a recent three-day check-up of a certain city's fuse boxes, a safety inspector accumulated three pecks of bridged fuses and about $4 in pennies, nickels and dimes (mostly pennies).

Fuseless wiring protection . . . now possible with Westinghouse NOFUZE devices . . . puts an end to such hazards. Nofuze wiring protection is tamper-proof!

With Nofuze wiring, accurately calibrated "De-ion" circuit breakers replace fuses. When a short-circuit or heavy overload occurs, the breaker protecting the affected circuit automatically opens. After the overload is removed, service can be restored instantly by a mere flip of the breaker handle.

Nofuze devices can't be blocked or bridged. Their calibration can't be changed because the breaker is sealed in a molded block at the factory. They are approved by the Underwriters' Laboratories.

You will be asked about Nofuze wiring protection. The coupon will bring you complete information.



Westinghouse Nofuze Wiring Protection is available for homes, buildings and industrial plants.

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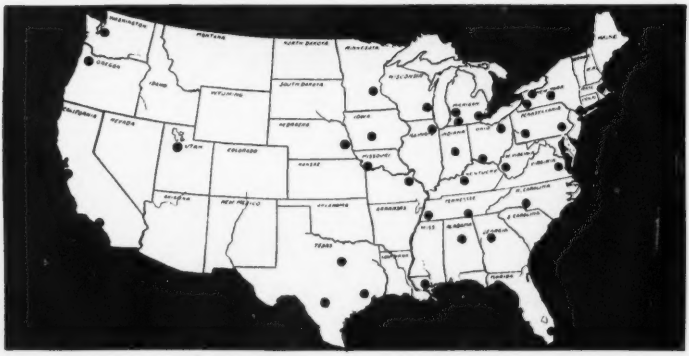
City.....*State*.....NFPQ 10-35

VIKING FIRE PREVENTION SERVICE
available from Coast to Coast



CALL ON VIKING . . . whenever you have need of the services of a fire prevention engineer. Viking welcomes every opportunity to be of service in furthering the cause of fire prevention. Without obligation, Viking engineers will make surveys and insurance cost analyses for owners of industrial and business properties; co-operate with progressive insurance men who are interested in providing complete insurance at the lowest possible cost; aid fire prevention organizations in every possible way. Please do not hesitate to call on Viking.

Why Sprinkler Protection and what kind? This booklet answers these and many other questions—should be in the file of everyone interested in fire prevention — a copy on request.

VIKING

AUTOMATIC SPRINKLER SYSTEMS

3 Separate Systems

the Viking Dry Pipe, Wet Pipe and Pre-Action & Deluge Systems provide the exact type of protection required by the risk. Viking Deferred Payment Plan enables the purchaser to pay for System out of insurance savings.

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"Believe Entire Plant Would Have Burned"

An A. D. T. Waterflow Alarm was credited with preventing the destruction of a wood working plant at Kansas City, Mo., on May 16, when a fire of undetermined origin broke out.

The alarm from the A. D. T. Supervised Sprinkler System was received at the Central Station at 3:24 A. M. When the fire department arrived, one sprinkler head was operating. The fire was confined to a small area, and was easily extinguished with only trivial damage from flames and water. Because of the nature of this particular risk, even a few minutes delay in the arrival of the fire department probably would have resulted in damage of serious proportions.

In a letter to the local A. D. T. manager, this subscriber said, "If it had not been for your promptness, we believe our entire plant would have burned down".

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Insurance men know the truth of the fireman's axiom, that "the first five minutes of a fire are worth the next five hours". . . that every minute of delay may mean the difference of thousands of dollars in the losses.

A. D. T. Sprinkler Supervisory and Waterflow alarm service makes the sprinkler system an automatic fire alarm. The instant a sprinkler head operates, an alarm is automatically transmitted to the fire department, insuring its arrival on the scene in those vital first few minutes when the fire is in its early stages. The service also maintains a continuous check on all vital parts of the system to assure effective operation when fire breaks out.

We shall be glad to send descriptive literature explaining the advantages of A. D. T. Services. Write A. D. T., 155 Sixth Avenue, New York.

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"There is more to this than meets the eye," remarked a man of science, as he studied Grinnell's latest product. What led to this conclusion?

The HEAT COLLECTOR—new in sprinklers, increasing speed of opening when a fire occurs by gathering heat of convection and conducting it to the soldered joint.

The HEMISPHERICAL SOLDERED JOINT—of large area, but exposing a minimum of solder edge to corrosion or loading, and that edge protected by inert wax.

The TAPERED NOZZLE—mirror smooth, less likely to clog, and discharging a solid jet, free from turmoil and eddy.

The STREAMLINE DEFLECTOR—distributing the water it receives with small loss of velocity head.

The SPRING HOOK—burnished to resist corrosion fatigue, and exerting a strong, elastic opening force.

Largely because of these new features of design, executed with the precision and finish characteristic of all Grinnell products, the DuraSpeed sprinkler excels in DURABILITY, SPEED and DISTRIBUTION.

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